THE REFINER AND NATURAL GASOLINE MANUFACTURER

In This Issue

Problems of operating gasoline plants in the Burbank field.

How one company disposes of its coke from pressure stills and fuel oil from the whole refinery.

Soda ash as an absorbent removes hydrogen sulphide from natural gas.

Keeping the plant operating.

Multiple streams from the bubbling type tower.

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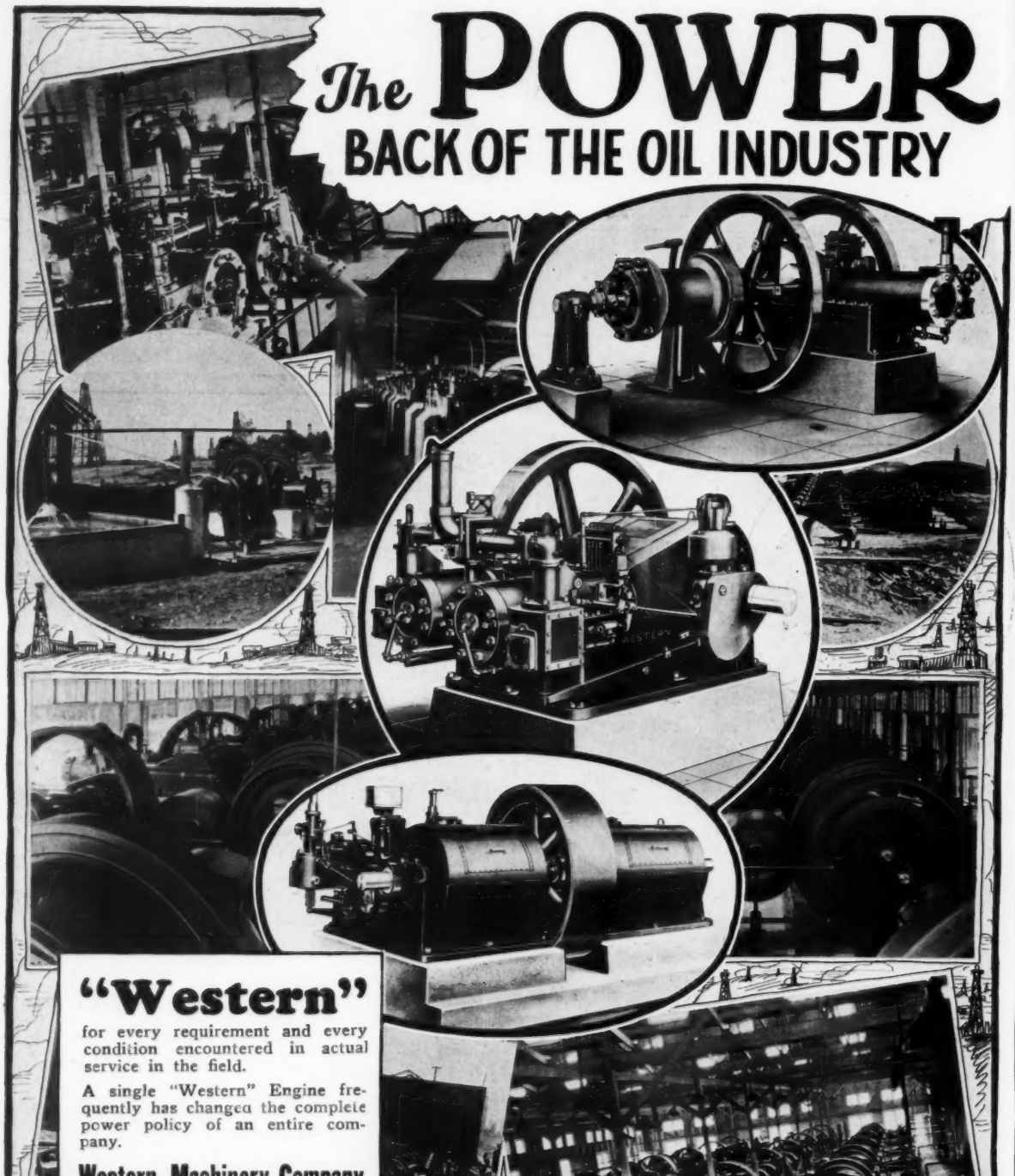

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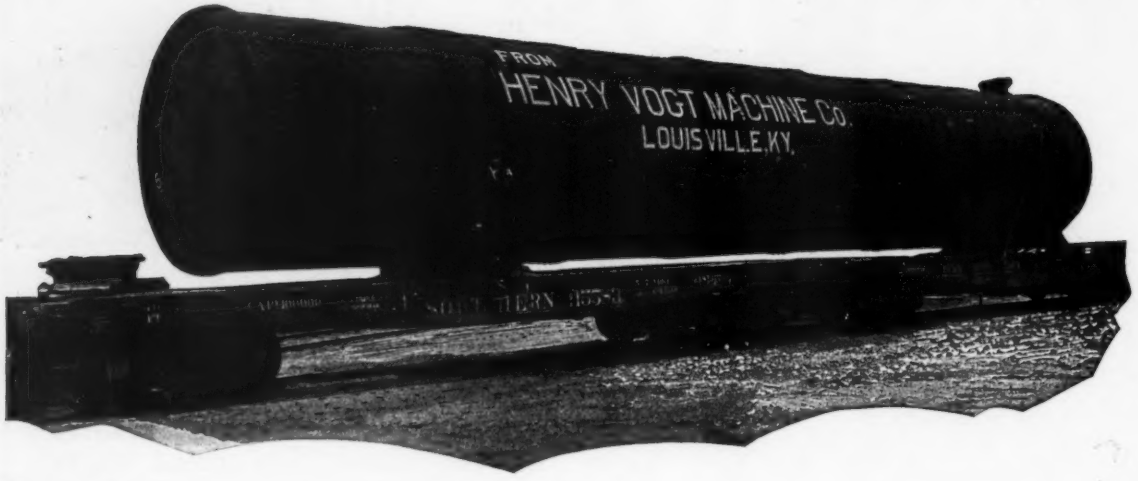

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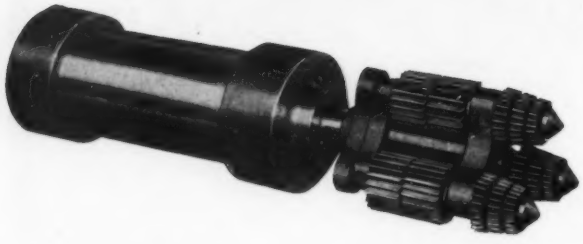

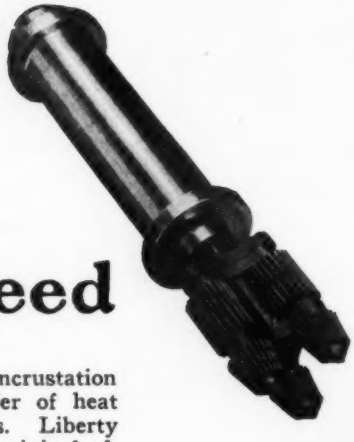

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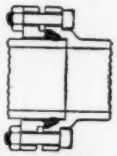

"ONE FLANGE IS LOOSE"

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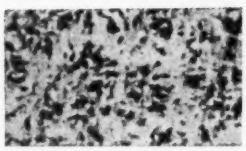
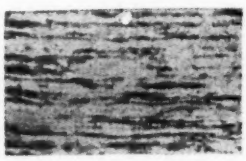
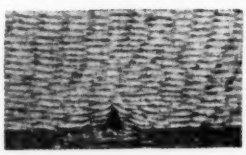


Photomicrograph of cast iron, much enlarged, showing granular structure.



Photomicrograph of wrought iron, muchenlarged, showingfibrous structure.



A piece of sheet steel, muchenlarged, showing surface and sectionalstructure with a typical pit.

AUTHENTIC data from over 250 years of service prove that cast iron becomes coated with rust but remains practically unimpaired in weight and strength under conditions that are fatal to other kinds of metal.

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In place of the interlocked grains or crystals of cast iron, wrought iron and steel are of a fibrous and, in thinly rolled steel, of a laminated structure, with distinct leaves overlapping each other. As corrosion takes place, these leaves or fibres scale off, constantly presenting a fresh surface to the corrosive agent.

Simplex pipe is flanged pipe minus the limitations of a joint made with rigid flanges. Thousands of feet of this material has been in use for years by the leading oil refineries of the United States for oil condensers.

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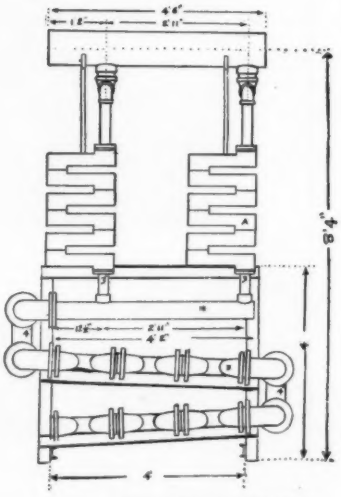

Diagram shows the combination complete with companion pipe flanges and ferrule. Specifications, Run Down Section: Weight, 185 lbs. 17 sq. ft. per section. Over all length, 45 1/16"; width, 16"; thickness, 7 7/8". Flanged openings, 4"; companion flanges tapped, 4"; cross section area, 13.06 sq. in.

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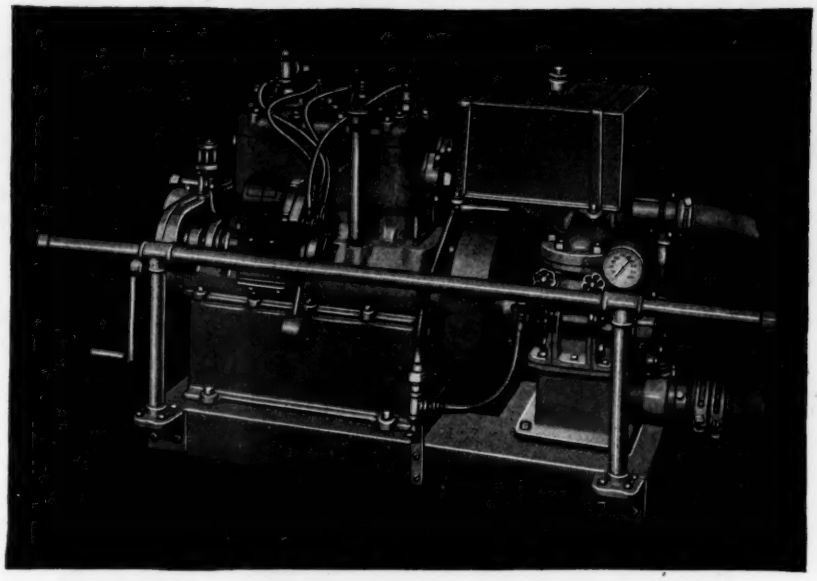

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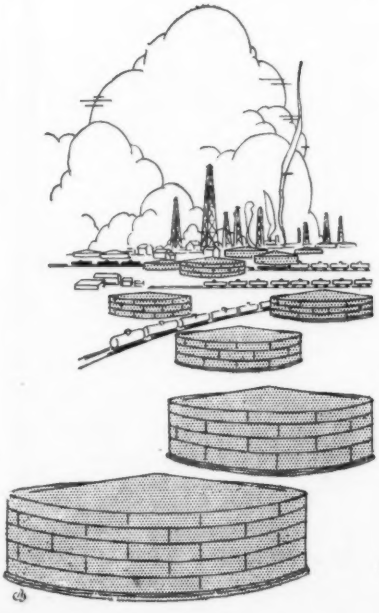

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The REFINER and NATURAL GASOLINE MANUFACTURER
Published Monthly by GULF PUBLISHING Co.
Houston, Texas

For men engaged in the operating branch of the refining and natural gasoline business.

Vol. 3 December No. 12

R. L. DUDLEY, President and Publisher

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A. P. I. Creates Public Relations Body

Meeting at Fort Worth considered most successful in history of the organization

Fort Worth, Texas, Dec. 15.—Among the accomplishments of the fifth annual meeting of the American Petroleum Institute, which closed here December 11, was that of creating a committee on public relations. A sum of $100,000 was set apart to start the work of giving the public facts by which the activities of the petroleum industry may be better understood.

The committee on public relations, to be named later by the president, will consist of nine members from the Institute, with a member from each of the following organizations:

Mid-Continent Oil and Gas Association, Western Petroleum Refiners Association, Association of Natural Gasoline Manufacturers, National Association of Independent Oil Producers, National Petroleum Marketers Association, American Oil Men's Association, Chamber of Mines and Oil.

According to the resolution adopted, creating this committee, its purpose shall be:

"For the purpose of accomplishing the regular and systematic publication of reliable information concerning the petroleum industry."

The committee is to function under the general auspices of the American Petroleum Institute. The committee will select its own chairman, secretary, treasurer and such sub-committees as may be necessary to accomplish desired results. The fund of $100,000 is to be raised by private subscriptions.

This first step toward seeking public confidence marks a departure in petroleum circles. The plan has been under consideration over a long period. It had opposition within the industry, however. Men who opposed it took the position that it was unfair for an industry to be defending itself when its record was clear. In deciding to seek a better public understanding, leaders of the industry are taking the move, knowing their business methods to be sound and their ethics equal to those of any other industry.

It is known, however, that unscrupulous men within the industry jeopardize its position by painting false pictures of wealth to be gained through buying stocks and promoting companies. So the men of sound business have decided to overcome the evil of unscrupulous practices by giving the public the facts of the industry.

The fifth institute meeting was generally considered the most successful in the history of the organization. Attendance at both general sessions and the special meetings was evidence of the hold the affairs of the institute has on the industry.

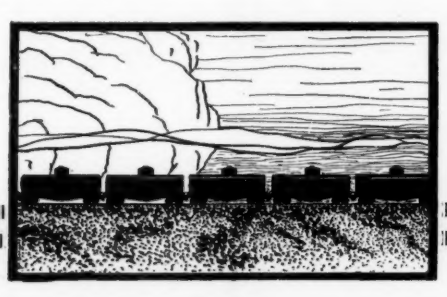
Standardization of oil field equipment occupied the largest amount of time on the program. Most of the deliberations in this bear on the producing end of the oil business. A committee to be named for considering standardization of tanks may bring this phase of the institute's activities directly within the refining branch of the industry.

The Fort Worth meeting was the first instance of the sessions being held in the "oil country." This afforded many men opportunities to combine trips into certain fields with attendance at the institute. The new Wortham field and the Big Lake area, both in Texas, drew visits from men of rank in the industry.

The meeting next year is to be in California but the city is to be selected yet.

Officials of the institute were elected as follows: J. Edgar Pew, vice president of the Sun Oil Company, Dallas, president; E. W. Clark, Union Oil Company of California, Los Angeles; Frank Phillips, Phillips Petroleum Company, Bartlesville; and Edward Prizer, Vacuum Oil Company, vice presidents; A. L. Beaty, treasurer: R. L. Welch, secretary and general counsel; W. R. Boyd, Jr., assistant secretary and counsel; Lacey Walker, assistant treasurer.

The executive committee is composed of J. Edgar Pew, E. W. Clark, A. L. Beaty, W. N. Davis, George S. Davison, E. C. Lufkin, Edward Prizer, Frank Phillips, A. C. Bedford, Robert W. Stewart, H. L. Doherty and Thomas A. O'Donnell.



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LONDON, ENG.—Caxton House

One-Piece Seamless Bottle-tight

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LIBRARY STANDARD OIL COMPANY EL SEGUNDO, CAL.

Acidless Gasoline Process Is Offered

Fuller's earth method developed by Thomas T. Gray after ten years study

POSSESSING striking departures from acid refining methods, a new catalytic process has just been placed on the market. Claims for the process are that it will result in a saving of from 20 cents to 30 cents a barrel in the cost of cracked gasolines.

The process is designed to bring cheapness of direct operation; lower direct and polymer losses in refining.

Thomas T. Gray, its inventor, has been working on the method since 1913. The following description is from a paper prepared by him and Mr. Mandelbaum. It was presented under the title, "Catalytic Treatment of Pressure Distillates in the Vapor Phase" before the division of petroleum chemistry at the meeting of the American Chemical Society in Washington last April.

The following takes up the paper at the theory of the process:

The process described in this paper is based on the polymerizing action of adsorbent materials, which, while much weaker than that of sulphuric acid, is yet strong enough to cause the polymerization of the highly unstable substances which give cracked distillates their undesirable properties. It is carried out in the vapor phase.[1] This not only makes it possible to combine the operation with a fractionation, but has the added advantage of utilizing the heat of the vapors to maintain a temperature which allows the convenient separation of the polymerized substances by virtue of their increased boiling point. Finally, it has been found that the effect of the catalyst on the substances involved is markedly different in the vapor phase from that in the liquid phase. The latter was studied, in the case of amylene and pinene, by Gurwitsch,[2] and for pinene and terpenes by Venable,[3] who found that lively exothermic reactions occurred in each case, even at room temperature, resulting, for amylene, in the formation of as much as 85 per cent of a higher boiling substance; for the terpene, in rearrangement and some polymerization.

The study of the vapor-phase reactions of these and other substances is not yet complete, but the indications are that, although the results are qualitatively the same, they are different in degree. Thus, in the case of amylene, it was found that by slowly distilling some of this substance through fuller's earth kept at 100° C. only 5 per cent of a higher boiling substance was obtained from the distillate, compared with the much higher amounts in the liquid phase reported by Gurwitsch. On the other hand, dimethylbutadiene reacts very vigorously with fuller's earth in the vapor phase. When a dilute solution of dimethylbutadiene in a mixture of chloroform, benzene, and toluene was distilled and the vapors were passed through fuller's earth, the distillate had an iodine number of 2.8, compared with that of 16.5 for the charge. From these observations the inference has been drawn that fuller's earth has only a mild polymerizing action on the vapors of olefins and a violent one on those of diolefins.

Laboratory Equipment

"The apparatus at present used for the laboratory study of the action of these catalysts on the vapors of cracked distillate is a glass tower (Fig. 1) the inlet tube, A, of which is connected to a boiling flask by a stopper. The vapors pass up through the annular space, B, surrounding a tube, C, about 2.5 cm. (1 inch) in diameter and 3.8 cm. (1.5 inches) long, which holds when filled about 25 grams of 60 to 90-mesh fuller's earth. They then pass down through the catalyst, which is held in place in the tube by a wire screen or some steel wool supported by a glass shelf, D, and finally through an opening in the shelf into a separating chamber, E, from which a small tube, F, provided with a trap to prevent vapors from passing, removes any condensed liquids, while another tube, G, sealed into the side of the chamber, acts as a vapor outlet. The vapors are then connected to a condenser. The inlet tube acts also, in the laboratory device, as a reflux line for the outer shell.

"Larger experimental towers are in use on a 10-gallon still, and one was used for a short time on a 6-barrel still. A tower with a capacity of 3 tons of fuller's earth has been built and will shortly be installed in a Mid-Continent refinery. Another, with 8 tons capacity, is being built, also for a Mid-Continent refinery. The principle of these larger units is the same as that of the laboratory device, and their structure similar. They differ only by the addition of a separate line for reflux and the necessary manholes for filling and emptying. The 8-ton tower will be 10 feet in diameter and 12 feet high over all. It is expected that it will treat over 2000 barrels of cracked gasoline or kerosene with each charge of clay.

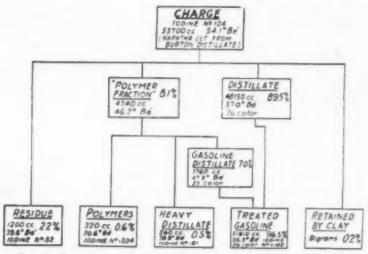

FIG. 2—FLOW SHEET FULLER'S EARTH TREATMENT VAPOR PHASE

Figure 2.

How Operated

When a cracked distillate is distilled through the apparatus, a thermometer in the catalyst shows, at the beginning of the operation, a considerably higher temperature than one in the entering vapors. Later the larger amount of vapor traversing the tube obscures this effect. The catalyst gradually darkens. A distillate greatly improved as regards color, odor, and stability is obtained at G. Twenty-three grams of fuller's earth will treat from 500 to 1500 cc., according to the nature of the cracked distillate. This is from 125 to 375 barrels per ton. The liquid condensed in F is dark in color, ranging from yellow to ruby-red or dark green, depending on the source of the cracked oil and the conditions of cracking. It usually amounts to about 15 per cent of the distillate. This liquid is largely the result of partial condensation of the vapors in the clay, and on being re-run it yields 90 to 95 per cent of colorless distillate, which can be added to the main distillate. The residue (about 0.3 to 1.0 per cent of the distillate) is a heavy, viscous, dark-colored oil, formed by polymerization of the unstable constituents of the vapors. It is expected that in refinery operation this liquid will not necessarily be collected from the separating chamber, but may be run back into the still, either by direct refluxing or by pumping. The partial condensation in the catalyst is appar-

[1] An interesting example of the simultaneity of inventions was furnished by Hall's application for a patent on a process of vapor-phase treatment with fuller's earth while Gray's was pending.

[2] Kolloid-Z., **11**, 17 (1912).

[3] J. Am. Chem. Soc., **45**, 728 (1923).

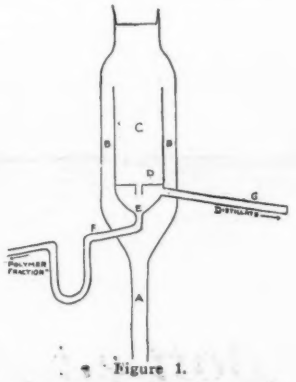

Figure 1.
Apparatus for laboratory study

ently due to the fact that the heat is furnished by the reaction and the surrounding vapor is insufficient to raise the temperature of the clay to that of the end point of the distillation. That the reaction is exothermic is shown by the temperature effect noted above, and also by the fact that under the same running conditions a distillate gives much less condensate in an active catalyst than in the same weight of inactive substance of about the same specific heat. This condensation not only serves to wash out the polymerized substances, but gives an additional fractionating effect. In fact, the combination of refluxing in the outer shell and condensation in the catalytic body is so efficient a fractionating device that it becomes possible, by connecting the tower to the cracking apparatus, to combine the refining and cutting in one step, and run finished gasoline directly from the cracking still. Operating in this manner with a catalytic tower containing fuller's earth connected to a pressure still, higher yields of gasoline were obtained than under similar conditions without the fuller's earth. This is attributed to the effect of the tremendous pressures exerted by the adsorbent on vapors passing through, and is analogous to the action of charcoal in the recovery of gasoline from natural gas. This increased yield has been noticed in some cases when straight-run gasoline has been cut from the crude using, as a fractionating device, a tower containing fuller's earth.

The material used as catalyst in the majority of the runs has been Florida fuller's earth, 60 to 90 mesh, prepared in a manner similar to that used for filtering lubricating oils. Texas and other earths have also been successfully applied. At the conclusion of the operation the earth is dry and flows as freely as when fresh, whether it is removed from the tower immediately or allowed to remain in it until cool. The easy flowing of the clay simplifies the design of large-scale units, as they need but be provided with a manhole in the bottom for discharging the catalyst.

Commercial installation of equipment of Gray process.

Experimental Run

A description of the experimental runs, the data of which are given in Fig. 2, will best serve to illustrate the method and results. In this case, in order better to be able to trace the changes taking place in the portion actually treated, it was separated from the remainder of the crude pressure distillate, which had been prepared from Mid-Continent crudes by the Burton process, by a preliminary fractionation using a short column filled with steel wool. The fraction taken was that boiling below 425° F. Its Engler distillation is shown in Fig. 3. The apparatus used for this run consisted of a 10-gallon still, to which was attached a steel catalytic tower with an inner shell 5 inches in diameter and 6 inches high. This was charged with 1000 grams of the 60 to 90 Florida clay.

At the end of the run the clay was removed from the tower and weighed. It was found to have gained 81 grams, or approximately 0.2 per cent of the vapor passing through it. This, added to the 0.5 per cent polymerization loss, gives a total of 0.7 per cent of the material treated, which may be considered the losses inherent in the process for this distillate. It will be noted that the actual polymerization loss is only 5 per cent of what is called the "polymer fraction," the rest of it being due to condensation in the catalyst. That portion of the polymer fraction called "heavy distillate" was ascribed to incomplete fractionation of the original charge rather than polymerization, because of its lower iodine number, which clearly classified it with the residue, rather than with the much more unsaturated polymers. Working with other cracked products, the sum of these losses has varied between 0.3 and 1.5 per cent.

Products Formed

The distillate represented in this run represented a yield of 291 barrels per ton of fuller's earth, and exhibited satisfactory properties. Its color was stable, it remained clear on standing, with no deposition of solid, and seemed in every respect to be the equal of straight-run products. In comparison it should be noted that on acid-treating the same charge with 3 pounds of 66 acid per barrel, not only was there a volumetric loss of 1.6 per cent observed, but the end point of the product was raised 15° F. as shown in Fig. 3. In addition, the color of the acid-treated product rapidly deteriorated, being +20 on the Saybolt colorimeter immediately after treatment and falling to 7 after exposure for a few days.

The nature of the polymers formed in the process remains to be discussed. Unfortunately, the amount so far available has been too small to make attempts to isolate pure substances from them profitable. It is expected that this difficulty will be overcome in the

(Continued on page 24.)

The Maintenance of Refinery Equipment

Prevention of mishaps is more important than accomplishing spectacular repairs

By Gwynne Raymond

"KEEP the refinery running!" This is the slogan of the maintenance men, and states their excuse for existence. "Keep the wheels turning!" "Be ready at any hour of the day or night, rain or shine, to patch a broken belt or replace a whole burned-out still bottom, or to meet any other emergency". "Idle equipment produces no dividends, but the expenses go right along". "The quicker it can be got going again the more the credit."

There is another side to this work, not so spectacular or exciting as the rush repair of a serious breakdown, but of far more importance to the prosperity of the company, and that is the prevention of these breakdowns before they occur. The words "anticipate" and "prevent" should be burned into the memory of every maintenance man. Nowhere is the saying "an ounce of prevention is worth a pound of cure" more true than around an oil refinery. A loose key may fall out of a sprocket, wreck a conveyor and tie up a whole battery of lub oil filters worth thousands of dollars a day. The rotor of a motor may get low in its bearings, strike sparks and cause an explosion that will wreck a pump house and endanger many lives. Eternal vigilance is the price of smoothly running machinery.

Keep a Calendar

Preventive work cannot be done in a haphazard manner. All machinery and equipment must be examined at regular intervals. These intervals will vary, of course, with the nature of the equipment and the service to which it is put. But the point is that the intervals must be deliberately laid out. If it is felt that certain motors in clean places can go for four months without having their bearings cleaned and examined, then it should be marked down on a calendar or other place each time these bearings are to be inspected. Other motors on fullers earth conveyors may need their bearings cleaned every thirty days. Then there should be a way to be reminded at the end of each month that these bearings are to be cleaned. The times of inspecting the various equipment must not be left to chance or the memory of man. The writer once asked the superintendent of a factory which did not employ an electrician, "How often do you have your motors inspected?" "Once a month", came the too prompt reply. A casual look around showed entirely too much dirt on some of the motors for one month's accumulation. Further questioning of the operators revealed that no one had looked at those motors in at least nine months. The superintendent thought they were being cared for. He had left it to someone's memory to call in the electrician and, due to the usual press of business, this had been neglected. It will pay to work up quite a definite program stating just how often each class and piece of equipment should be gone over thoroughly. For it is absolutely certain that the repair costs of a refinery can be considerably reduced if prevention work is thoroughly carried out.

At another time the writer sent a man through the repair departments of a large refinery, with instructions to go over all the machinery carefully and report just what could be found wrong with it. Now, it would seem that in the machine shops, boiler shops and other departments whose very business is the upkeep of a plant, the machinery would be found in the pink of condition. The length of a list of things wrong that this investigation produced was a great surprise and disappointment. Bearing cap bolts loose, keys worked part way out, clutches with one finger loose, gears not meshing properly, etc., etc. Each a sure forerunner of a breakdown! It was quite a blow, for these departments had prided themselves on their fine equipment. Why, then, was so much found wrong? Because no one had been systematically looking for trouble, and the defects were each so small that they had escaped the attention of the operators. Thereafter a man was sent through those shops once every three months, with instructions to investigate every bolt and screw, every bearing, clutch and key, etc. And there were very few breakdowns in those departments.

Prevention Before Repairs

In many cases the foremen of the various repair crafts can make all these examinations themselves, but they must make them consistently, following a regular routine, and they must not neglect them or put them off due to the press of other work. The foremen must be constantly impressed that prevention is far more important than repairs. If the foremen's duties prevent them from sparing the time necessary for this prevention work, they must assign it to one of the workmen under their jurisdiction. Thus, in the average, medium-sized refinery there should probably be a machinery inspector under the machine shop foreman, an electrical inspector under the chief electrician, a still inspector under the boiler maker foreman, a steam trap and piping inspector under the pipe fitter foreman, and a fire inspector or fire marshal reporting to the master mechanic. The foremen of the other crafts can take care of their own inspecting. In some cases it might be well to organize the inspectors separate from the repair foremen by having them report direct to the master mechanic, so that the inspectors can include as part of their duties seeing that the other workmen carry out the repairs in a proper manner. Thus, it is quite common for the still inspector to be separated from the boiler maker foreman, and even to have a certain amount of authority over him. All of this separation and division of authority is likely to result in confusion and friction, and the writer is not in favor of it as he feels that the craft foremen should be impressed with their entire responsibility for carrying out each job of work in a strictly first class manner, with no other inspection than that of their master mechanic.

These inspectors must be carefully chosen. They must really be able to see things. A workman who makes a fine hand to rush in after a breakdown and get a piece of equipment going again, any old way, in the shortest possible time, is not usually patient enough to go over this piece of equipment carefully when nothing is apparently wrong with it and examine every corner and part of it for a possible source of future trouble. The inspectors must also be able to get along with the operators. A man who has a grudge against the operators because he thinks they are abusing the machinery is not competent to get their co-operation, have them tell him their troubles, and be able to advise them on the care and use of their machinery. At one time a mechanic was sent through one of the filter houses of a certain refinery to look for trouble. His report was rather lengthy, and, as many of the items were minor adjustments, it was turned over to the operators with instructions to correct as many of the defects as they could themselves. Immediately there arose a loud protest that many of the reported defects were exaggerated or did not exist. Investigation showed that the mechanic had so far antagonized the operators that they were ready to go to any lengths to defeat his recommendations. The right kind of an inspector would have gotten the help of the operators at the time of the inspection and touched up the minor points at once. And he would have sold the operators thoroughly on the need of the other repairs, even though they involved some trouble on their part. Let me repeat, then, that the inspectors must be tactful men who can gain the confidence of the operators and learn from them their troubles. Nor must the inspector consider him-

self above working. He should carry a few tools with him and take care of minor adjustments without bothering the regular repair man. Thus he must feel himself personally responsible for the running of the machinery in his charge. He must keep going over it all the time, and sound the warnings and have it repaired before some serious break occurs. Any breakdown of his machinery which he had not foreseen should be considered a serious reflection upon the thoroughness of his work. He must get the feeling of personal pride in the smooth running of all his machinery.

To the operators themselves falls the responsibility of all oiling, most packing, and whatever small adjustments they can make. The inspectors will guide them and work with them, but they cannot do it all for them unless a disproportionately large number of inspectors is to be kept. In one refinery the electricians oiled all the motors in the plant. This kept three men busy—one on each shift. It was found possible to turn this work entirely over to the operators, send two of the electricians to more important work, and retain one man as inspector.

Inspector's Duty

The inspector should turn in to his foreman some kind of a written statement or report of the work he does each day and what he finds wrong, and his foreman should forward this report to the office. Some may object to this as red tape but the writer finds it has two distinct advantages. In the first place it adds to the inspector's sense of responsibility when he knows he must account to his superior for the work he has done on machinery in his care; and in the second place it does give the superior a quick way to know what kind of care both the operators and the inspectors are giving the equipment.

Every breakdown contains a lesson in prevention, and the work of the maintenance department is not completed until it has learned this lesson and applied it. Each foreman on a repair job must ask himself these questions: Just why did this machine break? Will it happen again, or can I prevent it by making some change or by properly instructing the operator? Is there any other place in the plant where an accident similar to this might happen? Can I prevent such an accident by taking proper precautions now?

Keep the Records

Right here a plea for some recorded data. Almost anything that is worth doing is worth remembering. An old triplex brine pump in a wax plant began giving trouble, and it was found that the crankshaft was cracked. By hearsay it was learned that the crankshaft of this same pump had given trouble a few years before and had been replaced. The old crankshaft was dug out of the junk pile, and not a thing could be found wrong with it! The cracked shaft was taken out and the old one was put back in, and the pump is running as well as ever. But the repair men are very much puzzled. Unfortunately, the men who made the first change are no longer on the job. What was wrong with the pump in the first place? Why was the shaft taken out and thrown on the junk pile? How fine it would be to turn to the history of this pump in the files and learn the answers to these riddles!

This applies to small items as well as large. Who has not heard long debates as to how long certain kinds of valves have lasted in acid, or what is the best kind of packing for hot oil? Records alone will really tell. In the preparation of these records the inspectors must come into action again. It is asking a bit too much of the hard pressed repair men to stop and tell all they have done to a certain pump. But the machinery inspector whose responsibility it is that the pump shall run without further breakdown does have time to tell at length. In certain cases where sketches and measurements are desirable the inspector may call for the help of a draftsman.

There are many unsolved problems that could be brought nearer to solution by the study of carefully kept records. Records could be kept of different ways of repairing brickwork under a still, for instance, until finally the best way would be arrived at. These records would show it to have the least cost for the longest life of the setting. In plants running to coke the cost of coke still repairs is a major item, and should be carefully recorded and studied. The writer is convinced that the slight cost of keeping such records of the life of equipment would more than pay for itself, in taking the guess out of the questions what kind of conveyor belting to buy, what kind of gaskets to use.

Most of the materials carried in the storehouse are held as prevention insurance. You would not carry any pump parts in stock, tying up money not earning interest, if you did not expect your pumps would wear out, and then the time saved in getting the pump going again would many times more than pay for the interest. Why, then, should not the inspectors, who are responsible for keeping the pumps running, have something to say about the repair parts carried in stock? By the continual study of their equipment they will come to know what parts are weakest, and will be in the best position to tell how much of such parts should be on hand ready to "keep her running." The writer does not mean that these parts should be turned over to the inspectors to be hidden away in some locker and forgotten. Repair parts should by all means be kept in one central store under a storekeeper. Thus only can the minimum number of parts protect the maximum amount of territory.

Only when a department is a long way removed from the storehouse is it permissible for it to store parts, and then only in limited quantities to tide it over an hour or so. Private hoards of stock in the departments will greatly inflate the materials account. No less than six different stocks of small valves and fittings were found in different parts of one refinery, amounting to at least four times the stock which should have been carried. Each inspector should know the kinds and standard amounts of all repair parts and supplies in stock with which he is concerned, and should consult with the storekeeper and obtain the approval of the master mechanic in charge on all changes. He should be furnished a list of his stocks. The inspector must make himself responsible for the ordering of special repair parts not carried in stock. If the machinery inspector knows that a certain pump rod is going to wear out soon he must see to it that a new one is ordered in plenty of time to be on hand when the old one finally gives up. Suppose you left this ordering to the department foreman. He is responsible, you say. And suppose another foreman has a similar pump. Result: Two rods in stock, whereas one would protect both pumps equally well.

And although the storekeeper can help, he cannot always prevent such duplication himself. Nor is he in the best position to be sure that special materials not carried in stock will be ordered in time to be on hand when needed. A certain acid kettle has a special bottom that wears out rapidly. The master mechanic thought the superintendent had ordered one, but the storekeeper had misinterpreted the verbal order given him. Result: Frantic telegrams, and a heavy casting shipped by express. The inspector would have had this bottom on his list by drawing and number, and would have been asking the storehouse about it often enough in advance so that it could not have been forgotten.

Fire Prevention

The most important inspector is the fire marshal. Woe be unto the refinery that, having been lucky enough not to have had a serious accident or fire, uses this as a reason for neglecting this vital preventor! The only way to keep even the best of workmen from losing their heads at the time of a fire is to drill them often—make them think fire problems and act them. Then when the emergency comes they will act automatically and do the right thing. As part of his duties the fire marshal should see that the plant is kept clean, free from rags and trash, etc., and that all the fire apparatus is in best working order, ready to go.

There are some kind of defects of equipment which the repair crafts cannot possibly see in their rounds of prevention. A motor may be underloaded and thus be wasting power. Piping may be too small and thus obstructing the free discharge of a pump. Such defects can be detected only by use of proper measuring instruments.

And these should certainly be provided. A silent drive chain was continually breaking links and giving trouble. No solution could be found. It was in line, running the right direction and properly lubricated. Finally a meter was attached to the motor, and it was found that, whereas the chain was designed for 75 horsepower, it was at times delivering nearly 100 horsepower. A treating system got out of balance and would not produce results satisfactory to the operators. Pumps were examined and found in good condition. Finally, Petot meters were installed on the discharge line, and one pump was found not to be delivering, despite the fact that it was in good condition. A test farther out on the line showed no pressure. The line was dismantled and found almost completely limed up at one spot.

Looking Ahead

Of course the master mechanic must not wait for such problems to come to him. A big part of his job is to be on the lookout for such possibilities. Every piece of equipment on the lot should be gone over in the course of time, to see that it is suited in size and design for the duty it has to perform. A refinery which generates its own power was undergoing extensive improvements, all of which would not be completed in a year's time. The master mechanic decided to check up the load that would ultimately be placed upon the generators, and was surprised to find that it would just about equal the capacity of the two of them, thus making it impossible to shut one down for repairs. A hurry-up order had to be placed for a third machine so that one of these could act as a standby.

Next, the water supply problem was investigated, by measuring the water that was being used by the still batteries and other departments, and estimating the increase when the plant was ready to run to capacity, and it was found that the source of make-up water was entirely inadequate. These are the problems that cannot always be worked out in advance of new construction, and justify the cost of giving the master mechanic a few instruments with which to check up his water, steam and electricity supplies. Perhaps if the size of one pump were increased a whole process could be speeded up, or perhaps the pump is adequate but the lines are too small.

It is true that a good, practical refiner with his years of experience can tell more about such things offhand than can the master mechanic simply by his own judgment, but the master mechanic can measure and test and figure, and then season his figures with the common sense of the operator, and between the two of them they will get much further than will either alone. A centrifugal wash water pump was installed in a certain department one summer, and the operators immediately pronounced it O. K., but the master mechanic's curiosity was not satisfied. In the winter time it would have to operate on hot water return from the batteries, which was at a much lower pressure than the plant service water used in the summer. Measurements of the discharge from the pump when operating on hot water showed just half enough delivered, so a new impeller had to be ordered to be installed in the fall. And so on, all over the plant. The burning of fuel offers a very profitable field for investigation and control. Measurements of the amount of fuel used, and of the stack temperature and CO_2 resulting may show possibilities of real saving by stopping up air leaks in the settings, or altering the size and shape of the fireboxes, installing checker walls and the like.

Rapid Work Necessary

The bulk of the work done by the maintenance departments is of course straight repair work. The first thing to be desired is that all repairs must be done quickly. Secondly, but none the less important, they must be done economically. Here it must be remembered that operating time is, in general, so much more valuable than repair costs that speed must at times outweigh economy. This imposes a burden of judgment on the repair organization. They must know just when to cut loose and get results even if they have a few men standing around waiting to help; and when they can take plenty of time to do the work economically. When a still comes down for bottom repairs the maintenance men must remember that it is capable of earning $25 to $50 an hour, which is considerably more than the pay of all the men that could possibly be crowded onto the job. So just as many extra men should be used as will in any way shorten the down time, and the job should be pushed night and day. On the other hand, when a boiler comes down for repairs it must be remembered that there is always at least one extra boiler in the boiler house, and so having this one down is not interfering with the plant nor costing it money in any way, and the repair gang should be kept lean and the job studied for economy.

Close co-operation between the maintenance department and the operating department is here solicited. The operating department often knows well in advance when a certain piece of equipment is going to be idle for a few hours. This information, if passed along to the inspector or the repair crews, will enable them to touch up a few weak spots they may know of without interfering with operations. How exasperating it is to learn, when rushing through some piping repairs to a still, that the still has been idle for a day and plenty of time could have been had to do the job right! Again, the yard foreman cannot be blamed for getting mad if he gets an order to clean a still about half past eight in the morning, just after his men have all been assigned for the day, when he finds that the still came down for cleaning at midnight and he could have been advised well ahead of the start of the day's work.

When a repair job requires the work of several different crafts someone has got to see that each craft gets onto the job at the proper programmed time with its necessary tools and all information, ready to go to work. And this someone has to be on the job all the time. If the master mechanic has many office duties to attend, he cannot do full justice to this sort of work and he should have an assistant who can. Obviously it cannot be left up to the foremen themselves, for they each have a dozen or so other jobs to attend all over the lot and cannot spend time looking up the foremen who preceded them on the job to see if their men are out of the way. A "walking boss" or a general foreman will be found a well paying investment in any but the smallest refineries. If any of the crafts employ but one or two workmen they can report directly to him, thus saving the cost of a sub foreman. He must know the status of all jobs, and leave the details up to his foremen.

Consider, for example, a typical refinery job which has already been mentioned, repairs to a still bottom. First the laborers have to tear out some brickwork, and the pipe fitters have to take out some coils, and the carpenters must throw up some scaffolding. Then everybody must get out of the way while the boiler makers burn out the old piece and get the new one in place. Before the boiler makers are entirely through, the carpenters must place centers so the brick masons can be starting to work replacing the damaged arches. In the meantime the machinists may have some work on the dampers. As soon as the boiler makers are out of the way the pipe fitters must get their coils back in, and lastly the insulators must patch up and the laborers must clean up the mess. Laborers, pipe fitters, carpenters, boiler makers, machinists, more corpenters, brick masons, more pipe fitters, insulators, more laborers.

Do you think all of these crafts are going to get on the job at just the right time unless some one man is responsible for the entire job and on the ground where he can watch it? Not unless the craft foremen waste a lot of time going to the job beforehand to see when their turn comes. And in the meantime there are twenty other jobs about the lot demanding their attention. A master mechanic on the job and not in the office is the only solution.

Decide—Then Act

Often a problem arises in repair work that for a time baffles the entire maintenance organization. One suggestion and another is made. It is hard to get a start. You are tempted to try one

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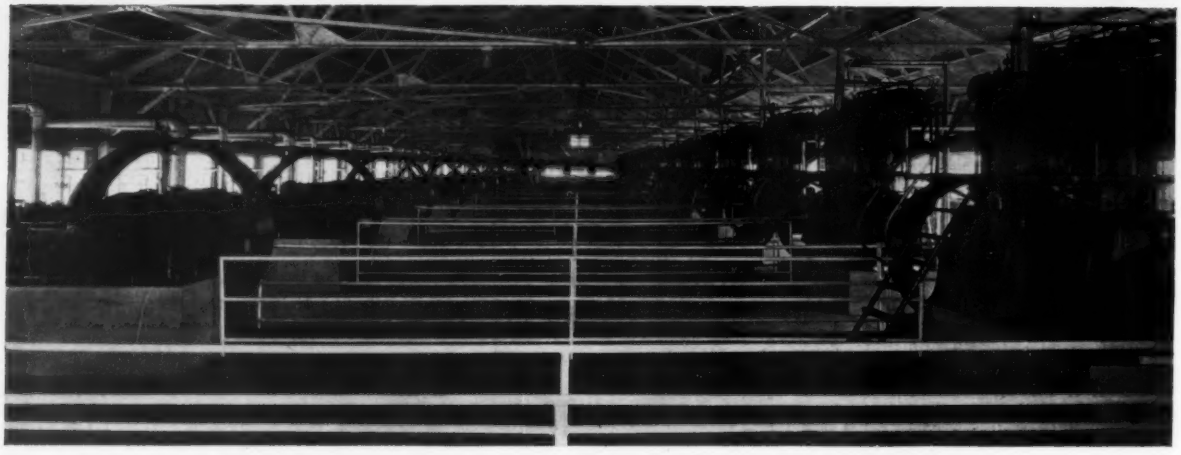

Interior of Philmar gasoline plant of the Phillips Petroleum company in the Burbank field.

Burbank Natural Gasoline Well Handled

Plant capacity soon will pass supply leaving some equipment unnecessary

By F. E. Rice
Gasoline Superintendent Phillips Petroleum Co.

THE Burbank oil pool, from the standpoint of gasoline plants, was probably better handled in regard to the use of natural gas for gasoline and natural gas residue for fuel than any other oil field ever drilled. At the time the first oil wells were drilled tests were made by several of the major oil companies to see if the gas was suitable for the manufacture of natural gasoline. The first tests showed something better than one gallon and a large volume of gas per well. Of course, as soon as very many wells were drilled the gasoline producers started to sign up gas contracts, and in a pool of this size, it is always a question who are going to build plants. The contracts proposed by oil companies were the same, that is, the gas was contracted for on what is known as either the Five Civilized Tribes contract or on a straight 33 1-3 per cent royalty basis.

It would be real interesting history if all the conferences and deals proposed for gas were collected and written. Such a paper would reveal many meetings and plans made by the heads of the biggest Mid-Continent production companies. The small producer had very little chance, as all production was tightly held by the so-called major companies, and, other things being equal, major companies would rather do business with themselves than small producers. In the first place their interests are so interlocked that it is good business to trade back and forth, and, in the next place, such business dealings are usually more satisfactory in that the big companies understand the situation better and are really more charitable if some point of dispute arises that requires settlement. The writer always gives the big company credit for knowing more about what is going on and besides companies that are buying gas from each other do not ask the other fellow to do the impossible, as they probably realize that down the road they might want something in return.

Absorption Plants

After the gas was contracted and the plant locations decided upon relative to the probable acreage that would be available for gas, the next question that came up in Burbank was the character of a gasoline plant. Most of the plants built were absorption gasoline plants. The Gypsy Oil Company, however, and later the Phillips Petroleum Company, built some compression gasoline plants in Burbank and I know the relative efficiencies of the Phillips Petroleum Company's compression plants will be of interest to the fraternity. We found that by compression to 300 pounds in midsummer and the best possible temperatures ordinarily obtained at plants, there was still left in the residue about one-half gallon of marketable gasoline. Cold winter weather greatly reduces the amount left in the residue at a compression plant. No test has yet been run at freezing temperature, but even at a temperature of around 40 degrees the one-half gallon remaining in the residue was reduced to about two-tenths, these results being obtained upon gas testing at the plant intake at about 1½ gallons. The Phillips Petroleum Company has high pressure oil absorbers on all gas coming from its compression plants which practically take all the remaining gasoline out of it.

Large Plants Possible

After the character of the plants in Burbank was determined, the capacity was the next thing to be considered. Competition has been so keen in this field that all gas practically has been taken care of as fast as it was available. Another thing, the very fact that the leases have been sold in advance of production every 6 months and that the sand was running so regular allowed the gasoline plants in Burbank to be of much larger size than could have been built in any other similar pool, outside of the Osage Nation. It would have been appalling to think of the waste of gas there would have been around Burbank if the leases had been commercial leases and all been drilled up at once. It was apparent from the very first that the plant would have available a large amount of gas and that this gas would last a long time. The maximum size plant that one could build in a hurry was the limiting size that was built in the Burbank field. Of course, there are plants there which were limited by the available gas, but, for instance, the Phillips Petroleum Company, the Gypsy Oil Company and the Skelly Oil Company all have more than one plant, and, of course, if one can build a large unit that is not unwieldy its operating cost is less than one of smaller size. In this conjunction, it is interesting to note that no gasoline manufacturer in the Mid-Continent field has built a plant which would handle over 20,000,000 feet of gas per 24 hours. At the present time there are

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...hat a reserve... ...arrels capacity was ...are miles of drainage ...should supply adequate fresh water for all the needs of the Burbank field, either for Phillips Petroleum Company or others.

Capital Invested

Some figures may be of interest: There are approximately 30 sections of producing territory in Burbank which means nearly 2,000 oil wells. The gasoline plants have a combined capacity of about 150,000,000 feet per day. It is estimated that by January 1 the volume of gas available will be considerably less than this and of course from then on the plants will not be operating on full capacity basis. However, this should not affect the production, and, ...ment. The fact that the average price of gasoline has been about 9 cents for the last two years makes it very apparent, even to the uninitiated, that the gasoline plants in the Burbank field, on the present price of gasoline, are unprofitable. The field, however, is rich in promise in that it will have a long life and that as the vacuum increases the oil sand will yield its richer vapors under vacuum and consequently hold up gas volumes. It is certain that the plants in the field will be producing as much as 10 years from now, of course, with a diminished production. Any additional acreage which is sold by the Osage Indian Agency later will add more wells and help the gasoline situation that much.

All residue gas from the plants in

Texhoma Delivers Fuel Oil by Pipe Line

Narrow gauge plant railroad used to load coke from stills into waiting box cars

EXCEPTIONAL facilities for handling fuel products from the refining process are evident at the first inspection of the plant of the Texhoma Oil and Refining Company at Wichita Falls, Texas.

These consist of a pipe line for delivering fuel into the city and an industrial railroad and equipment for hauling coke from the cracking stills to an elevated track for unloading.

While the pipe line was not built for the purpose it now serves, the departure is an example of how a refinery can make its equipment serve a second purpose, when the original one is no longer possible. It also shows how a pipe line may be built to serve as a fuel oil delivery system into a city.

Some years ago the Texhoma Company bought a line, which was converted into a gas main. The purpose was to get gas for fuel, drawing it from the Burkburnett field to the refining plant. Excess gas was then sold for commercial purposes in the city.

Later the gas supply dropped to such a figure that it was no longer possible to depend on it for refinery fuel purposes. That forced the plant back to fuel oil under its still and left it with some 20 miles of line. The result was that part of the line between the plant and the Burkburnett field was leased to another company, while the two miles between the plant and the city served as the basis for an intense campaign to get contracts for furnishing fuel oil for heating and industrial purposes in the city.

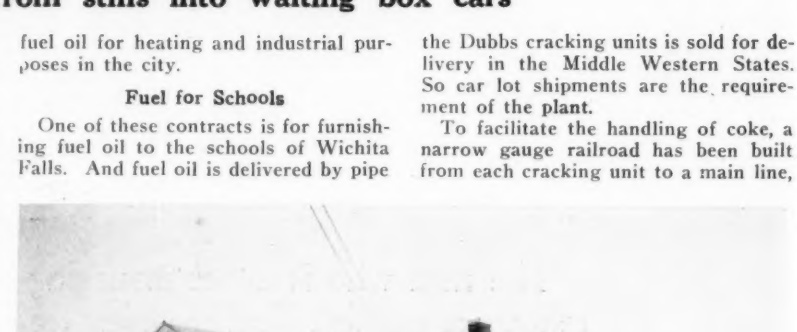
Fuel for Schools

One of these contracts is for furnishing fuel oil to the schools of Wichita Falls. And fuel oil is delivered by pipe lines from the plant to tanks at the school buildings. Pumps at the refinery deliver this oil.

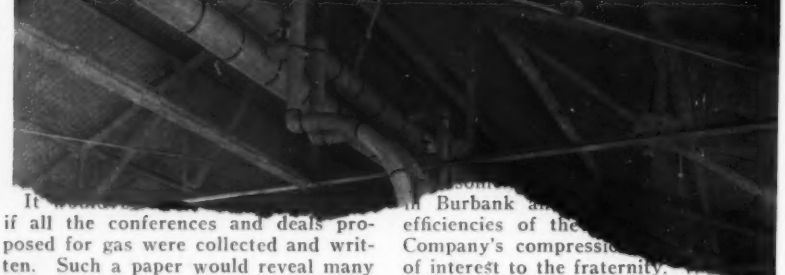
Other fuel oil contracts can be served either by direct connections, or trucks can be used for a short haul in the city, rather than one from the plant to the customer.

The greater part of the coke from the Dubbs cracking units is sold for delivery in the Middle Western States. So car lot shipments are the requirement of the plant.

To facilitate the handling of coke, a narrow gauge railroad has been built from each cracking unit to a main line, which leads to an elevated loading rack. Small cars, whose construction is similar to that of the large coal cars of the railroad companies, are run under the cracking units and the coke emptied into the open cars. Then the gasoline locomotive pulls the load over to the elevated track, where these small cars are dumped into the waiting coal cars.



Office and laboratory.



Plant Capacity

The Texhoma plant is handling 5000 barrels of crude oil daily. It can be pushed to 7000 barrels daily.

The refining capacity consists of 13 shell stills and four Dubbs units. The cracking units can handle 2000 barrels daily. The shell stills are used for both crude chargings and for re-run work, being adapted to what ever needs the sales of the company require. Gasoline, kerosene, gas oil and fuel oil are the products of the plant. It is operating now on Archer County crude oil.

All blending is done at the refinery loading rack. Output of the natural gasoline plants in the Burkburnett area comes to the refinery in tank cars. Blending products are provided as needed to furnish the motor fuel of required specification.

Welded connections are used in every practical place of the plant. Welding is somewhat new with the company. But part of the pipe shop has been given over to welding. Heat exchangers and much of the pipe construction, formerly bought ready for assembling, is now welded in the refinery shop. The pump station is a welded job throughout.

It would be interesting if all the conferences and deals proposed for gas were collected and written. Such a paper would reveal many meetings and plans made by the heads of the biggest Mid-Continent production companies. The small producer had very little chance, as all production was tightly held by the so-called major companies, and, other things being equal, major companies would rather do business with themselves than small producers. In the first place their interests are so interlocked that it is good business to trade back and forth, and, in the next place, such business dealings are usually more satisfactory in that the big companies understand the situation better and are really more charitable if some point of dispute arises that requires settlement. The Burbank [illegible] efficiencies of the [illegible] Company's compressi[illegible] of interest to the fraternity: [illegible] that by compression to 300 pounds in midsummer and the best possible temperatures ordinarily obtained at plants, there was still left in the residue about one-half gallon of marketable gasoline. Cold winter weather greatly reduces the amount left in the residue at a compression plant. No test has yet been run at freezing temperature, but even at a temperature of around 40 degrees the one-half gallon remaining in the residue was reduced to about two-tenths, these results being obtained upon gas testing at the plant intake at about 1½ gallons. The Phillips Petroleum Company has high pressure oil absorbers on all gas coming from its

Burbank Natural Gasoline Well Handled

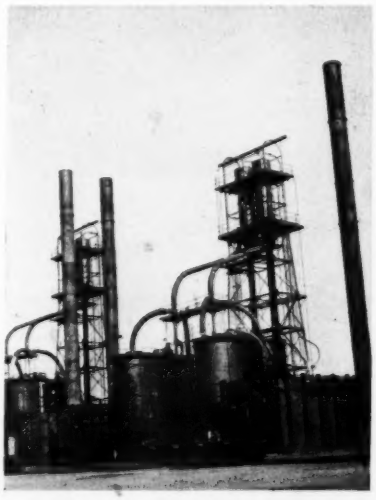
(Continued form page 18.)

12 gasoline plants in the Burbank oil pool which have a total production of about 225,000 gallons of gasoline net. This production is about 10 per cent of the total amount of natural gasoline produced in the United States, and has all developed from nothing up to its present magnitude in about 2½ years.

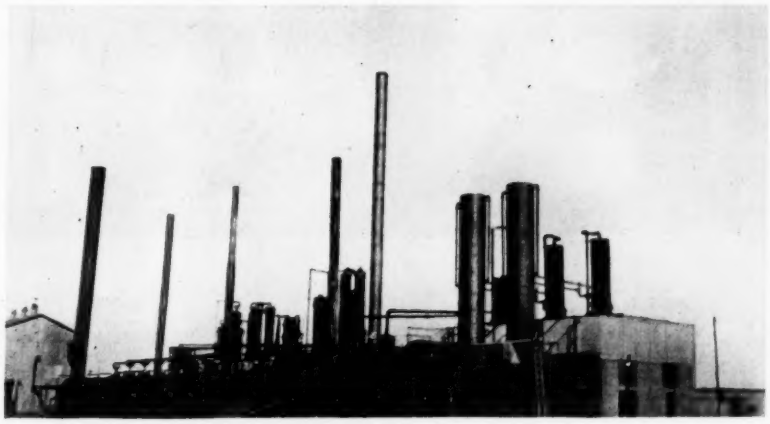
A production curve made up from the beginning will be of little value for the reason that there have been new wells on new leases added continuously. However, I am able to give you some decline curves on individual leases which show that the gasoline production is holding fairly constant, although the gas volume has fallen off considerably. Along this connection the average leases in the old part of the field has increased in richness from one gallon up to two gallons per thousand cubic feet. This increase has taken place almost entirely after the wells were cleaned out, put to pumping and the gasoline plants tied to the casing-heads. Of course, this means that the wells which were originally held at atmospheric pressure have now probably 5 inches of vacuum at the casing-heads. This vacuum is being held back by the producers and will probably be raised gradually during the next 3 or 4 years. Upon the application of high amount of vacuum, that is above 20 inches, the gasoline content of the gas should show at least 5 gallons per thousand cubic feet and perhaps more.

No Unusual Problems

Of course, the volume of gas will be very materially reduced and there is no doubt that the total production will be somewhat larger than now. No particular problems have arisen in Burbank in conjunction with the manufacture of gasoline. The product is an average one, showing a gravity better than 80 and of course is sour. Most of the Burbank plants are treating gasoline and are making a grade "A" product that is doctor sweet and non-corrosive. Phillips Petroleum Company, in making doctor sweet gasoline, has done considerable experimenting with the hypochlorite process and is now using a combination caustic and chlorine gas wash.



The four Dubbs cracking units.



All shell stills are in one battery.

The Burbank oil field finally assumed such large proportions that two railroad companies thought it worth while to build branch lines to the field, the Santa Fe coming from the west and the Midland Valley from the east. When one considers the average freight of one car of gasoline amounts to $250 per car and that there are from 20 to 25 cars a day shipped from this field, one can readily see why the railroad companies were willing to build these new branch lines.

Water has been one problem at Burbank, which as soon as the next hard rain occurs, will be permanently solved. The Carter Oil Company went to the Arkansas River, sunk water wells and had a fair filtered water. However, it was so hard that the company finally put in a complete water softening plant in conjunction with its water station. Phillips Petroleum Company, supplying a large amount of water, first obtained water from local streams, but, as usually happens, these streams became polluted with salt water which makes it unfit for plant usage. The situation was so serious that a reservoir of about 10,000,000 barrels capacity was built with 12 square miles of drainage area that should supply adequate fresh water for all the needs of the Burbank field, either for Phillips Petroleum Company or others.

Capital Invested

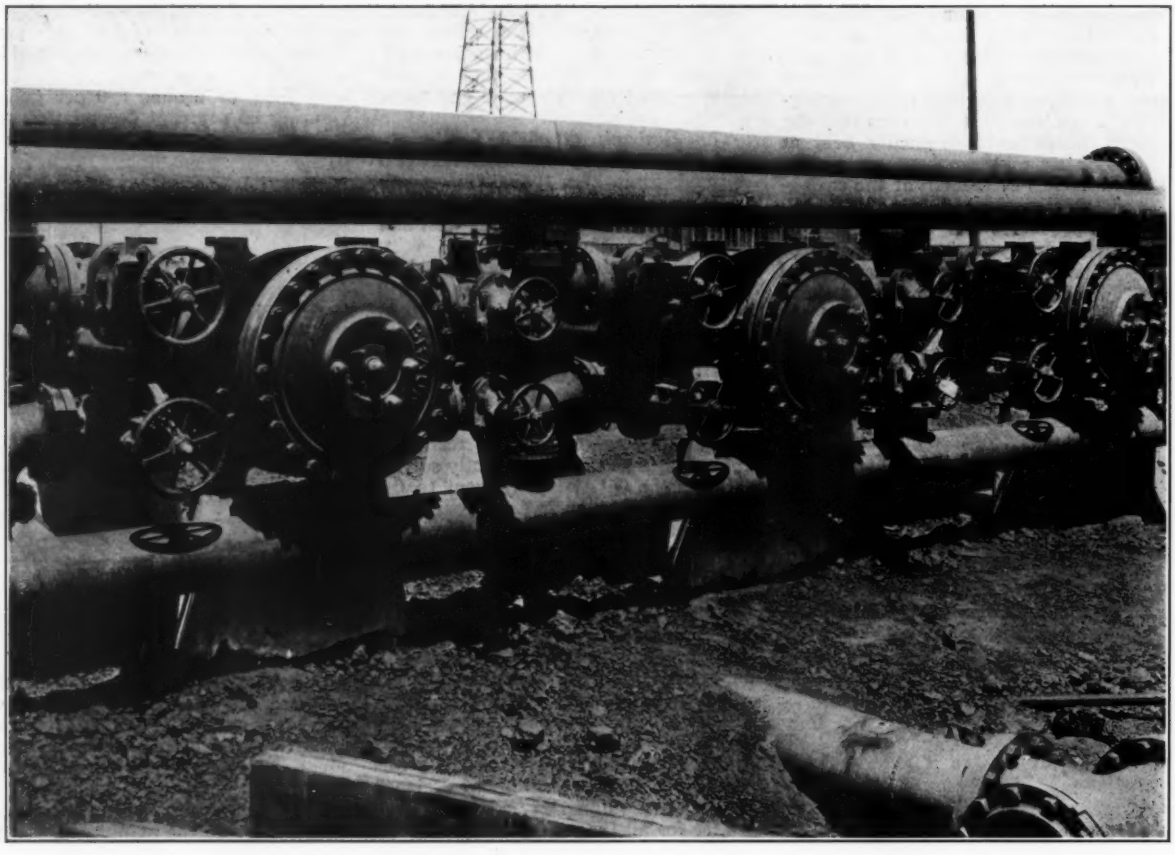
Some figures may be of interest: There are approximately 30 sections of producing territory in Burbank which means nearly 2,000 oil wells. The gasoline plants have a combined capacity of about 150,000,000 feet per day. It is estimated that by January 1 the volume of gas available will be considerably less than this and of course from then on the plants will not be operating on full capacity basis. However, this should not affect the production, and, as a matter of fact, increased efficiencies and enriched yield from the gas will hold production for at least one year. At present there is about $11,000,000 invested in gasoline plants in the Burbank field, or around $50 per gallon. Figuring 20 per cent depreciation and 8 per cent interest on this money it means that every gallon of gasoline produced in the Burbank pool has an overhead of about 3½ cents per gallon which must be added to the royalty, which is 33⅓ per cent and actual operating costs of the plants, before any profit is derived from this big investment. The fact that the average price of gasoline has been about 9 cents for the last two years makes it very apparent, even to the uninitiated, that the gasoline plants in the Burbank field, on the present price of gasoline, are unprofitable. The field, however, is rich in promise in that it will have a long life and that as the vacuum increases the oil sand will yield its richer vapors under vacuum and consequently hold up gas volumes. It is certain that the plants in the field will be producing as much as 10 years from now, of course, with a diminished production. Any additional acreage which is sold by the Osage Indian Agency later will add more wells and help the gasoline situation that much.

Gasoline train for handling coke.

All residue gas from the plants in

Braun

Gas and Jacke



A battery of three Braun gas coolers in casing head gas compressor plant Dominguez, California — capacity 10,000,000 cu. feet per 24 hours.

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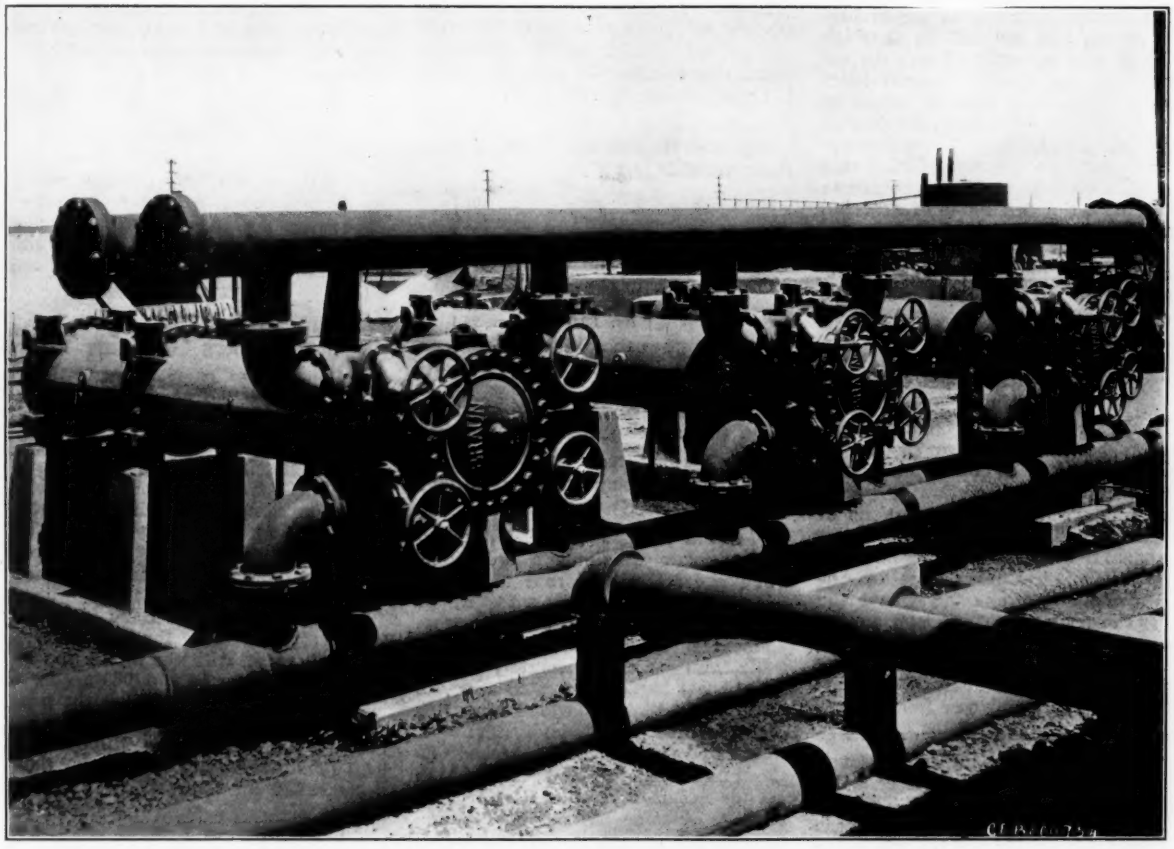

Three Braun exchangers cooling 900 g. p. m. of pure water for gas engine jackets at compression plant Signal Hill, California.

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Acidless Gasoline Process is Offered

(Continued from page 14.)

near future with the installation of the commercial units already mentioned.

The polymerized material in each case so far studied seems to be composed of at least two types of components. One of these, a viscous, colored liquid, is distillable at pressures of the order of 0.1 mm. The other is a semisolid, sometimes tacky mass, which does not flow at ordinary temperatures. Both have high iodine numbers, which clearly differentiate them from the still residues. In the one case in which sufficient of the polymer was obtained to make possible the examination of its physical properties, the distillable component (0.4 per cent of the distillate treated) boiled between 300° and 400° F. at 0.2 mm. Its iodine number (Hanus) was above 200. It had a gravity of 28.6° Be. at 60° F. and a Saybolt viscosity of 407 at 100° F. Its cold test was +5° F., at which point it was perfectly clear. As according to the physical characteristics already determined this oil seems to correspond with high-grade lubricating oils, the possibilities of vapor-phase polymerization as a source of lubricants should be considered. It is possible to so regulate the conditions of cracking that the substances which polymerize to form them would be present in greater proportions. This point can be discussed in greater detail when the chemical nature of the polymers is more definitely known.

Comparison of Treated and Untreated Products

In order to obtain a basis of comparison between products treated by this process and the corresponding untreated products, the following procedure was adopted. Equal portions of the same cracked distillate were run at the same time and under the some conditions through similar glass towers, one containing the catalyst and the other the same weight of Ottawa sand. To assure equal fractionation, both distillations were carried to the same point, above the desired end point; after which each polymer fraction was added to the corresponding distillate and the mixture re-run, with a LeBel Henninger column, to the same end point in each case. A comparison of the products shows:

1—There is no difference in the Engler distillations.

2—The specific gravity of the treated product is slightly higher than that of the untreated; representative figures are 0.7592 as against 0.7572; another case gave 0.7499 against 0.7467.

3—The color of the treated distillate is usually better when freshly prepared; it is always much more stable than the untreated.

4—The unsaturation, as measured by the sulfuric acid absorption method, is not appreciably different. This does not vitiate the conclusion that the more unstable unsaturated compounds are removed by polymerization, since the amount of polymer formed indicates that there would be a difference amounting to about 0.5 per cent, which is unmeasurable by this method.

5—The iodine number of the treated distillate is slightly lower than that of the untreated:

	Treated	Untreated
A	99.8	101.7
	100.1	101.8
	100.0	102.1
	100.2	102.0
	Av. 100.0	Av. 101.9
B	87.5	94.5
	88.5	93.7
	Av. 88.0	Av. 94.1

In both cases the difference between the two is well outside the experimental error, as shown by the checks obtained, and is of the order expected from the small amount of polymer formed.

6—The gumming test is always greatly reduced by treatment.

7—Sulfur is not appreciably reduced when the catalyst is fuller's earth alone. Fuller's earth with porous metals or metallic oxides mixed with it, or mounted on it, is more satisfactory. Kerosenes from cracked distillates made from gas oils moderately high in sulfur must be doctor-treated after the catalytic distillation, where the clay alone is used. With high-sulfur oils, such as unmixed Mexican cracked distillates, the writers have been unable to get satisfactory results, even as regards stability of color, without the addition of a metal, except at the expense of lower yields per ton of catalyst.

8—Burning (kerosenes). The treated distillate always gives a burn test much superior to either the untreated or acid-treated distillates. Often the catalytically treated distillate passes the long-time burning specifications, which is unusual for a refined oil prepared solely from cracked products. One such case is given below, which is especially interesting because of the difference in sulfur content between the acid-treated and catalytic oils and the difference in their burn tests. Both samples were doctor-treated after the treatment mentioned, and the acid-treated sample was in addition clayed.

	Catalytic	Acid-treated
Gravity	42.0° Be	42.7° Be.
Viscosity/60° (Saybolt)	485 sec.	467 sec.
Corrosion	Slight	None
Doctor	Sweet	Sweet
Color (Saybolt)	+25	18
Unsaturated (per cent)	12.1	12.4
Sulfur (per cent)	0.070	0.045
Long time burn	Yes	No.

The yield in this catalytic run was 286 barrels per ton of fuller's earth.

Conclusion

It is possible by vapor-phase treatment with an adsorbent catalyst, such as fuller's earth, to produce satisfactory gasoline and burning oils from pressure distillates. The advantages of the process over current practice are:

1—The apparatus and operation are simple.

2—The material used is available and inexpensive.

3—Finished products may be run directly from the cracking apparatus, except in the case of burning oils, where a subsequent doctor treatment may be necessary.

4—The losses are only a fraction of those obtained with sulfuric acid.

5—Burning oils obtained are superior to those obtained by acid treatment.

With the vapor-phase catalytic process success has also been met in stabilizing certain straight-run products, such as gasolines from California crudes, which are otherwise unstable.

---

the field is being utilized through booster station by the gas lessee under Osage rules and regulations. This gas is being used from Tulsa to Kansas City and this very fact adds to the value of this rich oil field. Three lines were laid as much as 30 miles to take care of this residue gas. Through it all the Osage Nation is obtaining a rich and profitable revenue as it collects 1/18 of all gasoline sold and 3 cents for every thousand feet of gas which is utilized commercially.

The writer, as one of the representatives of the gasoline fraternity, thinks the Burbank field is handled in an ideal manner, that is, everything is being utilized, and during no time in the development of the production of the field was there any product wasted.

Russian Oil Output Shows Gain for Year

Washington, D. C., Dec. 21.—Production totalling 365,800,000 poods (1 pood equals 36 pounds) in the three principal Russian oil fields during the fiscal year ended September 30, last, an increase of 53,200,000 poods over the production of the preceding year, is claimed by the soviet government in so-called "official" figures which have just been reported to the petroleum section of the department of commerce.

Increased activity at Baku is stated to be responsible for the greater part of the increase, with the production of that field placed at 258,700,000 poods, a gain of 45,900,000 poods over the previous year. The Grozny fields also enlarged their output from 91,700,000 to 99,400,000 poods, but the Emba field decreased from 8,100,000 to 7,700,000 poods.

Foreign sales of Russian petroleum products during the fiscal year 1924 are stated to have totaled 44,000,000 poods, as compared with 19,870,000 poods in 1922. The 1924 figures constitute the actual exports, but foreign sales concluded during the year call for the delivery of approximately 30,000,000 poods in addition to the actual exports, bringing the total foreign sales for the year to 74,000,000 poods.

Soviet sales methods during the last fiscal year, it is stated, differed considerably from those of previous years, when the export of petroleum products was based on contracts with two or three large foreign firms.

Multiple Streams From Bubble Type Tower

Several tower designs may be employed to accomplish this sort of fractionating

By George W. Reid

SINCE towers of the bubbling type are to be discussed in this article, and since this peculiar, separative, fractionating column is meeting the approval, and to a great extent the requirements of more and more refiners, it will be well here to discuss and give

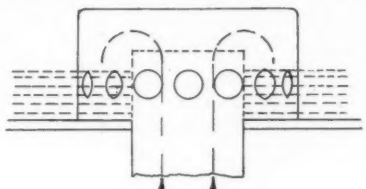


Figure 1.

diagrams of the details of their construction.

On referring to the figures 1, 2, and 3 it will be noted that the three types of dephlegmative bubbling devices differ but little. In effect they are all identical as in each case the vapors driven from the still or retort and after their reception into the tower proper, are caused to enter nipples, which are either flush with the bottom of the plate or extend below it an inch or so, then to impinge upon a solid interior of the bell covering where they are sharply deflected downward, suffering a reduction in velocity, and then to pass through one or two inches of previously condensed liquid. In this manner the heavier molecules which are carried out of the crude being distilled mechanically by the lighter members, are both knocked out of the grasp (cohesion and adhesion) of the carriers and are more or less selectively absorbed by the layer of liquid through which the vapor must pass at reduced velocity.

Types Differ

Figures 1, 2 and 3, differ only in the method of conveying the dephlegmated vapors out of the bell or dome through the liquid in which the covering is partially submerged. The holes, (Fig. 1); the slit-like apertures (Fig. 2); and the serrated edge, (Fig 3) are means of accomplishing identical results.

The question as to how the liquid level is effectually maintained has been asked and for the purpose of elucidation, Fig 4 is given detailing the mechanical construction of the device which is called the over-flow, down spout, or liquid level controlling device.

How Corrected

Perhaps it is well to point out the error committed by some designers and builders of this device which has been called to at attention of the writer. Some overflows have been installed consisting merely of a pipe reaching from one bubble plate to within a few inches of the plate below; leaving the lower end open to receive the upward flowing vapors countercurrent to the overflow from the uppermost plate. This permits certain portions of the vapors to escape dephlegmation in the bubbling device and deprives them of the benefits to be received there which reduces, of course, the efficiency of the tower to some extent. This error is corrected in the down spout as diagramed in Fig. 4. Here the liquid accumulating overflows, drops into cup below the lower plate and rises upward over the edge of cup, thus sealing the down spout against the rising vapors. From the cup then the liquid flows to the opposite side of the tower to overflow again to the next lower plate. In this manner all condensed liquid accumulating in all bubble plates is conducted downward to the bottom of the tower and from there to still or run down.

By the use of this device the evils of the open pipe down spout are elim-

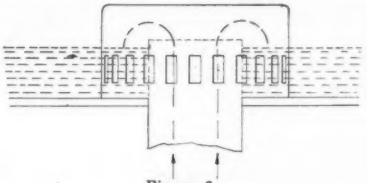


Figure 2.

inated and overcome and the overflow system is confined in usage only to that purpose for which it was installed. Here we have a stream of down-pouring condensate and a current of rising vapors each being treated or towered entirely unmolested and independent of the other.

Combined Results

This tower then combines the quality of partial condensation with that of separation, absorption, dephlegmation and fractionates very close cuts. Overlap of boiling range is greatly reduced and it follows that percentage recovery is correspondingly increased. It is a matter of record, in fact, that one refiner in the Wichita Falls district, upon installation of this tower, increased the percentage recoverey of marketable gasoline from 38 per cent to 43.8 per cent (average figures). Along with these beneficial and gratifying results occurred increase in charging capacity and much greater ease in control of all streams and temperatures.

With the installation of the down-spout or overflow arrangement the question naturally arises as to the advisability of utilizing these overflow products as additional streams, thereby converting tower to one yielding multiple streams. Experimentation has indicated that this is both plausible and feasible. The top and bottom stream from the old tower, especially that tower yielding Kerosene over head and gas oil at the base is common practice and has been so employed for some time. Bottom streams from towers in series is also practiced extensively, but streams from each plate or pan of towers have been taken with only indifferent success. The Refiner contemplating installation of bubble towers, especially towers to yield 4 to 8 or more streams, should by no means dismantle or tear away their old conventional towers. It is far better to install the bubbling type between the still and the old tower where possible for many reasons. This statement will be referred to and explained further in the discussion.

Removing Color

Figure 5 indicates the general design of a tower so constructed as to yield five central streams and one overhead. This is merely the bubble tower discussed above having each overflow diverted outside of the tower shell to cooling medium and run down. Experience has shown that unless an effective dephlegmator to remove color is placed in line before the tower that the first and second plate will produce streams which are colored. These streams will also occur with much lower gravity than the higher streams. It is also true that the two or three uppermost plates will yield the more valuable streams—these distillates or condensates requiring very little or no further treatment. The condition and specifiications of all plate products very appreciably with the character of crude being refined and especial consideration must be given that important factor.

The drawing (Fig. 5) is for purposes of detailing mechanical arrangement only. The tower in practice, of about 25 feet in length or height should have five feet of space below and 10 feet above the bubble plates, thus providing

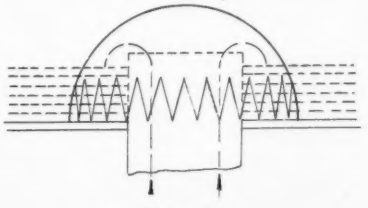
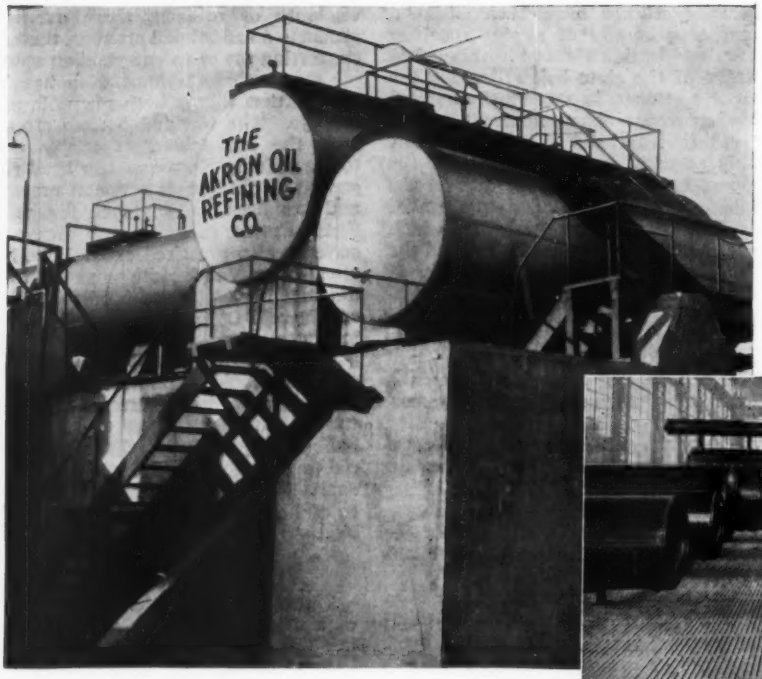
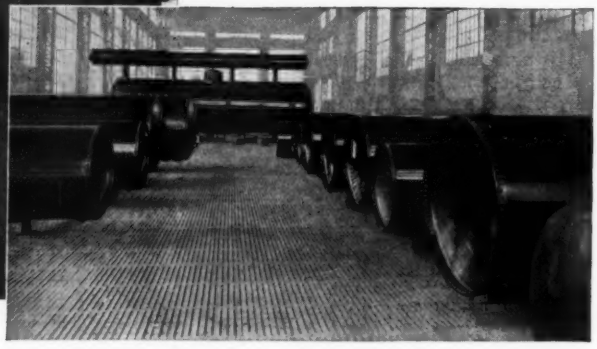


Figure 3.

Field Storage and





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BIGGS

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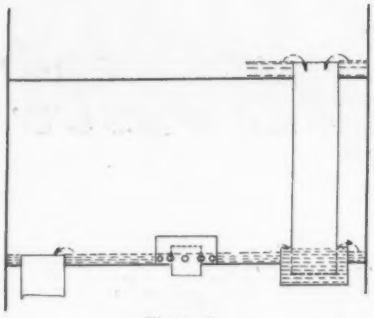


Figure 4.

a void or "throw" to allow gravity separation of vapor and liquid, in addition to the fractionation occuring while vapors are passing through the plates. The central 10 feet then, can carry 10 plates one foot apart and overflow into ten streams. These streams after cooling should manifold in the receiving house in such a manner that any or all can be diverted either to finished stock or to recycle stock. It is here that attention is called to the statement advising the refiner to permit his conventional towers to remain intact.

The term conventional tower is used here to indicate that type of tower commonly included in continuous distillation equipment, namely—a tower employing as baffle plates punctured with a great number of small holes. No further explanation is required as this plate has been extensively used for a number of years. The conventional towers, then, equipped with sprays for recycling are important factors in handling of streams from the bubble tower which are not usuable as produced by the tower plates. It is desirable to spray or recycle the unfinished streams obtained not over the tower connected in series with the bubble type tower from which they were derived, but over the next conventional tower yielding a stream of lower gravity higher End Point fraction. This is not an arbitrary statement for any spraying medium handled through any tower of higher temperature than the I. B. P. of the sprayed oil will be stripped of its lighter components almost to the point of tower temperature.

Converting Equipment

In this manner the old equipment is converted from a fractionating column into a separative and absorptive reflux tower. Certain of these towers through which the spray medium is recycled will be found to yield more or less valuable streams at their base, otherwise the bottom product should be led again into the still. Since the bubble tower operating behind them nearest the still is an excellent control factor as to temperature, velocity and volume of vapors handled the bottom or back trap streams as well as the top or overhead, will be more or less automatically regulated. Temperature may be further controlled in the recycle tower by the installation of a good temperature controller which instrument will control the amount or volume of oil being sprayed into the top of the column. More of the uses and benefits of control instruments in general will be given at some later writing, for there is indeed much more to be told of their application and uses than space here permits.

The reader has probably concluded that the refinery employing equipment as herein described will be all streams, but consideration must be given the fact that with each gallon or barrel of product received in tanks as finished material at the first heating, and requiring no further distillation or handling; effects a saving in time, steam, and fuel oil consumed. This latter factor, that of fuel oil consumed per barrel of crude treated, when reduced from an average of 5 or 5½ per cent to an average of 4.25 per cent; when figures are based on a charging rate of 60,000 barrels monthly effects a saving alone of $450.00 monthly, which is not to be overlooked, especially when the general low margin of profit is considered. In addition to this economy the installation of such equipment, as previously stated, giving an increase in percentage recovery of gasoline of 5.8 per cent or 2.4 gallons per barrel of crude treated. This indicates an increase of gasoline recovery per month or a charging rate of 60,000 barrels or 144,000 gallons. Added to this the increase in general efficiency, ease of control and accounting, saving in steam due to elimination of rerunning etc., and the value of such equipment is obvious.

The bubbling type of tower is being extensively exploited and employed.

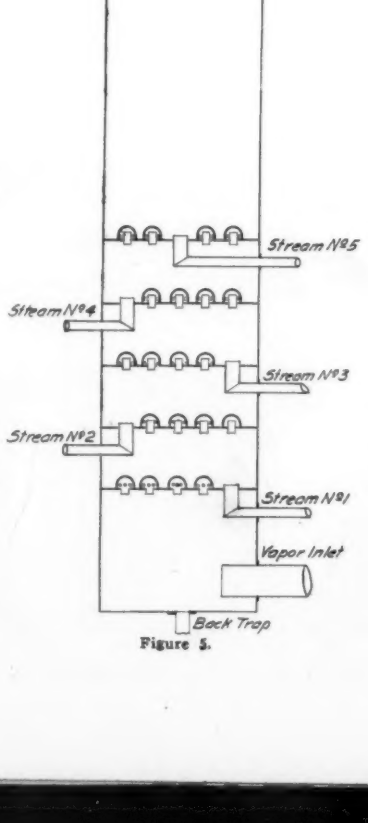


Figure 5.

The multiple streams obtainable, both in co-operation with recycling equipment and without are being advantageously produced and in the words of one refiner, "The more streams the merrier."

New Oklahoma Safety Code Will Be Issued

Tulsa, Okla., Dec. 17.—The new safety code for the oil industry in Oklahoma, including refining and natural gasoline plants will probably be issued on Jan. 1, to become effective with that date. This was decided after a conference held in Oklahoma City December 16 between State Labor Commissioner Claude E. Connolly and representatives of oil companies operating in Oklahoma, including refiners and natural gasoline plant operators.

There developed at the conference some differences over Connolly's alluding to the safety code as approved by the oil men and in a number of cases the labor commissioner proved that his requirements were in line with the requirements of the compensation insurance companies.

The understanding at adjournment of the conference therefore, was that Connolly should make such few changes as were agreed upon and then issue the safety code as soon as possible. More than twenty representatives of oil companies attended the conference in Oklahoma City. It is expected that the installation of the new safety code will tend to reduce compensation insurance rates appreciably.

Duff Catalogs Out

Duff jacks, all sizes, are featured in Catalog No. 105, published by the Duff Manufacturing Company, Pittsburgh, Pennsylvania.

The catalog covers screw jacks of capacities from 10 to 75 tons; track or trip jacks, designed to lower the load gradually or drop it instantly; automatic lowering jacks; oil well jacks, and special purpose jacks.

Copies of the catalog will be sent to any one interested.

Plant for Montana

Billings, Montana.—The Montana Company that has been organized here with a capital of $1,000,000 and backed by the American Gasoline Company of Los Angeles, contemplates the construction of a natural gasoline plant at Chinook on the Bowes structure in this state.

Lubricator Described

McCord Lubricators for all types of oil engines are described in a bulletin called "The Economy of Better Lubrication", published by the McCord Radiator and Manufacturing Company, Detroit, Michigan. Copies of the bulletin will be sent upon application.

Natural Gas Purification Accomplished

Canadian concern removes hydrogen sulphide by soda ash absorption method

Chatham, Ont., Dec. 5.—Western Ontario has in the past few months been the scene of a quietly conducted experiment as a result of which natural gas containing hydrogen sulphide has for the first time been purified.

The experiment was conducted at Port Alma, field headquarters of the Union Natural Gas Company, and as a result of its success, involving an estimated outlay of nearly $200,000, purified gas was this week turned into the pipe lines serving Chatham, Windsor, Petrolia, Sarnia, Ridgetown and intermediate points.

The plant had not been in operation more than twenty four hours before consumers noticed a pronounced difference in the gas delivered; and especially the absence of the conspicuous sulphur odor which ever since Tilbury gas was first marketed has been a subject of complaint.

In the Niagara fields, the gas is pure and odorless; but the Tilbury gas contains a very small percentage of hydrogen sulphide. It takes, however, very little of this constituent to attract notice.

The sulphur content of the gas was noticeable from the first. Housewives complained that the gas gave them headaches. Wall paints containing white lead were blackened by the fumes. Silverware, gilt picture frames, gilt bindings on books, ornamental brass work, brass electric fixtures—all turned black in course of time. Stoves, stove pipes and kitchen utensils were inevitably corroded by the sulphur.

First Effort Failed

The consumers in Kent, Essex and Lambton, never having known any other natural gas, accepted the Tilbury stuff with reservations; but the situation was different when, in the latter part of 1913, the Southern Ontario Gas Company first delivered the Tilbury product to its consumers in Brantford, Woodstock and other places. These had been accustomed to the odorless gas from the Niagara fields, and there was an instant and vehement outcry. The Southern Ontario Gas Company, to placate them, undertook to purify its entire gas supply by means of a central purifying plant at Glenwood. The company made a determined effort to deliver pure gas, but ultimately the plant was abandoned as a failure. It is reputed to have netted a dead loss of more than $200,000 to the company.

It is, indeed, only a few years since the Koppers Company of Pittsburgh, Pa., first worked out a feasible process for purifying coke oven and other manufactured gases. The Koppers process is at present in successful operation in something like 33 artificial gas plants.

When it was first suggested that the process could be adapted to natural gas, a good deal of doubt was felt. Experiments were conducted at Port Alma, which gave promise that the process would actually purify natural gas. Still the venture looked like a big gamble. A plant on a commercial scale to handle the entire natural gas supply of the three cities, half a dozen towns and a dozen villages and townships was bound to cost a lot of money; with the risk always present that the outlay might in the end prove a dead loss. The rather uncertain gas rate situation at that time also seems to have led the company to hesitate, and consider the proposition pretty carefully.

Equipment Used

Late last spring the final decision was reached by the Union Natural Gas Company to go ahead with the purification scheme. Construction of the plant was commenced in the summer. Partial purification was under way by November 26; and this week the entire gas supply was treated for the first time.

The compressor plant, built some years ago at Port Alma, provided the nucleus of the purification plant. One of the big compressor pumps was taken out to make room for the machinery required to run the purification plants; leaving three big pumps still in place should they ever be required for compressor purposes.

The rest of the purification plant, and the most conspicuous part of it, stands behind the old compressor plant, a curious array of tall stacks and big tanks. On a clear day the stack, 150 feet high and painted a weatherproof black, can be seen for miles. Anyone venturesome and nervy enough to climb the ladder can, it is claimed, see Cleveland and most of the far-reaching territory north, west and east served by the Union Company.

Two tall tanks, 50 feet high, termed actifiers, stand to right and left of the stack. Adjoining each actifier is a smaller tank, 31 feet high, known as an absorber. Other items of equipment close by are a cement sump, to hold the solution used in the process, and a brick building where the soda ash, the principal constituent of the solution, is stored in large quantities.

Absorption Process

Though the equipment is extensive, the process itself is simple enough. The natural gas enters the absorbers at the bottom. It rises, and meets the soda ash solution, which is pumped in and sprayed from above. The big tanks are filled with wooden trays, laid tier on tier, with openings through which the gas forces its way. These trays, saturated with the solution, present to the gas an enormous contact surface.

The hydrogen sulphide content of the gas is absorbed by the soda ash solution. The purified gas flows on, into the pipe lines which lead to Chatham, Windsor, Ridgetown, Wallaceburg, Sarnia, Petrolia, and the other places served by the Union system.

Meanwhile, the solution, having absorbed the hydrogen sulphide, passes into the larger tanks, known as actifiers. It enters the actifiers from above, and descends through a similar arrangement of wooden trays. A strong current of pure air is driven by fans into the bottom of the huge tanks. This air current separates the hydrogen sulphide from the solution. The hydrogen sulphide is carried out through the stack and swept away on the upper air. The solution, once more purified and activated, goes down into the sump; and from the sump it is pumped back into the absorbers to begin its work all over again.

In the process a certain amount of soda ash is lost every day; and to make this up, fresh soda ash and water are added regularly.

Inside the old compressor plant is what may be called the operating equipment. This consists of two generators, three big pumps, and three powerful fans. The generators operate the pumps, which force the solution under pressure into the absorbers, and the fans, which drive the pure air into the actifiers. Not all this equipment is, however, in constant use. A single generator, it is calculated, will operate two fans and two pumps and the entire purification plant. So that one generator, one pump and one fan are held in reserve for emergencies.

The purification equipment itself provides an ample margin of safety. On Wednesday of this week a single absorber and actifier was purifying the entire gas supply. So it will be seen that the supply of purified gas, with all this equipment in reserve, is pretty well protected against interruption.

Advantages

To keep the solution at a certain specified temperature, two heaters are provided. These stand well to the rear of the rest of the plant and are connected with it by four large pipes which bring out the cold solution and carry it back warmed. In the warmer months of the year it is not necessary to heat the solution.

A good many advantages are claimed for the purified gas. The disagreeable odor for which Tilbury gas has long been famous—or infamous—automatic-

ally vanished and becomes a memory. The discoloration of silver, brass, gilt picture frames, paint and the like it eliminated. No more will the busy housewife, plying her evening care, have occasion to complain of the corrosion of stoves, of pots and pans, and of pipes.

Indeed, with pure gas the thrifty housewife will be able to use more efficient and economical equipment, get better results from the gas she burns, and actually cut down her gas bills. As an instance, copper-coil heaters, which never could be used with the sulphur gas, can be utilized with the pure product, with resulting increase in efficiency.

The company itself, however, has not been forgotten by the purification Santa Claus. In addition to an array of doubtless better satisfied customers, the company will experience such minor but very substantial benefits as lessened corrosion, and consequently longer life, of pipe lines, distributing systems, meters and incidental equipment.

That the plant is a proven success today does not alter the fact that up till a week ago it was still regarded by many as a daring experiment. It represents the first attempt to adapt the Koppers Company process to natural gas, the first attempt to handle any gas at high pressure, and the first attempt to treat a gas entirely lacking in carbon dioxide. The outlay is stated to run pretty close to $200,000.

Oil Flow Outlined

"Oil Flow in Pipe Lines", is the subject of a new bulletin by R. S. Danforth. In this bulletin the author gives charts showing the pressure loss in different sized pipe lines; the conversion of viscometer readings, and the horsepower required for pumping.

Further information regarding the bulletin can be obtained from the King Knight Company, San Francisco, California.

Refinery Supply Company, Tulsa, Offers R. F. Control Apparatus

The Refinery Supply Company of Tulsa, Oklahoma, has perfected a control apparatus for use in natural gasoline plants, refineries and solvent recovery plants.

The R. F. Control Apparatus as it is known, is a modification of the Bureau of Mines type of Haldine Gas Analysis Apparatus and in its present design is intended more especially for control work in natural gasoline plants. However, the principles of analysis involved are such that the apparatus is of value for accurate gas analysis and for control and research work at refineries and other chemical industries where problems of absorption, distillation and fractionation are encountered.

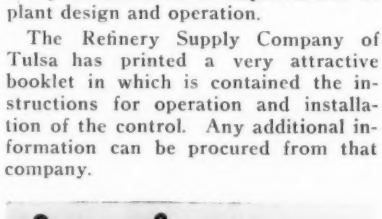
This modified apparatus was devised by C. G. Oberfell of the Hope Engineering and Supply Company, and embodies the principles of volumetric methods of gas analysis and vapor pressures of liquids.

The degree of accuracy obtained by the use of the apparatus is one of the main features and the devisor claims that by observing instructions regarding methods of procedure in making tests, errors generally encountered in gas analysis is practically eliminated.

Following is a list of uses for the R. F. Control Apparatus:

1. Testing denuded oils and thereby accurately determining still efficiency.
2. Determining the effect of temperatures on the extraction efficiency of denuded oils.
3. Determining the efficiency of absorbent oils.
4. Determination of oil rates.
5. Determination of absorber efficiency.
6. Determination of comparative efficiencies of various absorber baffles.
7. Determination of fractional efficiency.
8. Determination of air content of casinghead gas.
9. Flue gas analysis.
10. Analysis of gases containing air with small quantities of combustible gases.
11. Vapor pressure determination.
12. Research work on problems generally encountered in improvement of plant design and operation.

The Refinery Supply Company of Tulsa has printed a very attractive booklet in which is contained the instructions for operation and installation of the control. Any additional information can be procured from that company.



Strip Chart Recorder of American Schaefer Budenberg Corp.

Strip Chart Recorder Is Available for Refineries

Users of refinery equipment will be interested in a new strip chart recorder recently put on the market by the American Schaeffer & Budenberg Corporation, Berry and South Fifth streets, Brooklyn, New York.

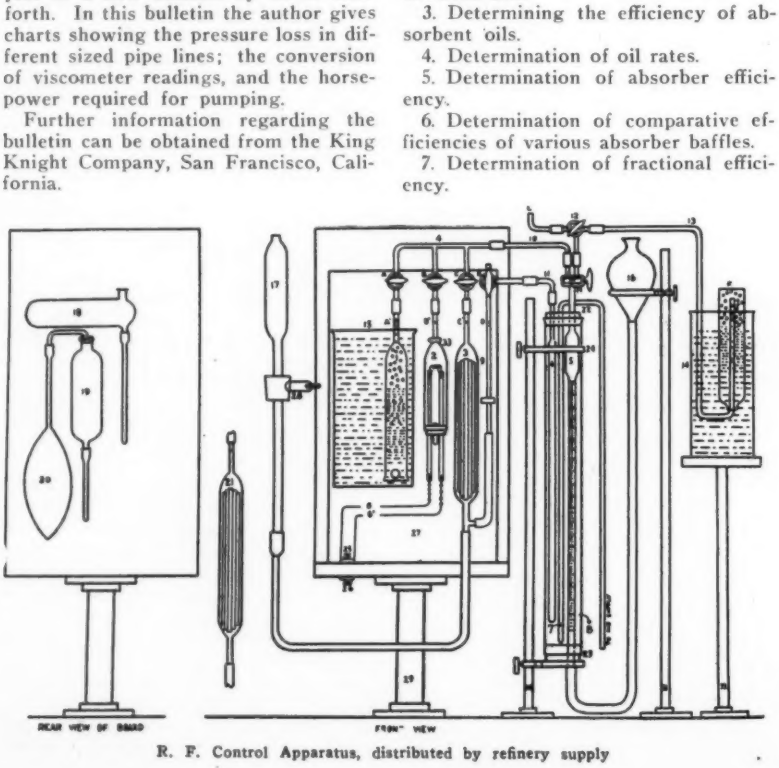
This chart is designed for applications where it is desirable to obtain a record of temperatures or pressures over an extended period and where the cycles of operation are of relatively short duration requiring a wide, open record enabling detection and study of the slightest variations.

The recorder can be furnished for recording all pressures, steam, air, water, ammonia, hydraulic, vacuum, and temperature.

A clock movement of special construction controls the chart and moves it 6 inches per hour. An automatic rewind device takes up the recorded part of the chart.

A list of standard charts includes one for practically all requirements. Special charts can be engraved to order.

The company will send further information to any one interested.



R. F. Control Apparatus, distributed by refinery supply

Refining and the Petroleum Industry

Part of an address delivered before American Petroleum Institute at Fort Worth

By Amos L. Beaty
President The Texas Company

AN important industry could not exist on an uninhabited no-man's-land. Besides the industry there must co-exist a public to be served and a government to maintain order. The industry itself is one side of the triangle. It includes those who furnish the capital, usually stockholders, who are presumed to derive revenue from investment, and the workers, who with brains or brawn earn their livelihood. The public at large, wherein are found the consumers or patrons, constitutes another and important side. The third is the government, which in addition to its direct interest as a consumer here and there, is the arbiter or umpire of the game. I think we could not ignore the government as a real factor, or, because of its interest as a consumer, merge it with others in that category, for it is undeniable that the policies of government, state and national, are important factors in our weal or woe, and the success and perpetuity of the government itself depend largely upon the course of its industries. Nor would it be painting the picture to make demarkation between stockholders and workers, for in the industry they are one. Furthermore, while it does not change the aspect, we cannot lose sight of the fact that the industry and the public overlap. More than a million people of the United States are supported by salaries or wages drawn from the oil business and perhaps another million participate in the enjoyment of earnings otherwise.

Petroleum Divisions

The petroleum business has four major subdivisions or branches, (1) the production of crude; (2) refining or manufacture; (3) pipe line transportation, and (4) marketing operations. And whether we consider it one business or several businesses, what I have said is true, and we cannot close our eyes to effects that flow in three directions from definite causes, or to reactions that may be expected. Yet in almost every instance instead of conflict there is coincidence of interest. It sometimes appears on the surface that what will benefit one side will injure another but when proper analysis is made this usually is found to be a mistake. Never where three interests subject more logically to accord.

My figure of speech may not be orthodox in rhetoric, but it will serve to convey the idea. What I intend to discuss is the three-sided aspect of some of our problems. I shall group them in relation to the four main branches of the business stated in the inverse order of the foregoing. In other words I shall discuss marketing matters first and then travel back to the primary branch, crude production.

Shortsighted Practices

Sellers, consumers and the government all have theories, not to say policies, some of which challenge careful consideration and may admit of improvement. It is not cynical to say this, because it is equally true that erroneous practices and shortsighted policies are tolerated and seem to be rather freely forgiven, at least for the moment. All parties at interest apparently understand that perfection is not to be expected. We stumble along and comfort ourselves with the thought that we are doing the best we can. Yet it is undoubtedly true that at some stage accounts must be rendered. If marketers fail to treat consumers fairly the latter will demand a reckoning somewhere. If consumers become excited and cause the merchant to be harrassed by crazy legislation they will live to rue the day. Likewise the government will suffer through the lack of support and respect, to say nothing of more direct loss, if it exceeds or falls short of what wise government should be. We are marooned in the world together, all in the midst of causes and effects, and none can escape the working of that system which is wiser and better than any man-made rule.

During recent years we have seen several periods of over-production and consequent low prices of gasoline. In several of those periods it has happened that some large marketing company alarmed by the loss of gallonage, due to keen and continued competition, has seen fit to make extreme and sweeping price reductions. These reductions have been so extreme at times that plainly the marketing company was selling at a loss. Other companies found it necessary to meet the prices, the alternative being a loss of position, idle facilities and organization, and excessive accumulation of stocks. The result has been a general reduction of prices followed by actual losses. The initiation of a program of that kind may not violate laws which prohibit such selling to drive out or limit competition, and as a commercial proposition it may be justified on the theory of stabilization. It may even be justified on the theory that if a physician knows how to treat only one disease, and that disease is fits, he should start his treatment by throwing the patient into fits. But selling below cost is certainly a drastic remedy. I have never felt like prescribing it and have often wondered about its efficacy. It has the effect of stabilization, also uniformity; it makes the business uniformly bad.

Public Reaction

Moreover, consumers are led to false conclusions. They reason that if the companies can sell gasoline for 10 cents today they can do the same thing tomorrow, and that there is profiteering when the price is 20 cents. Their impression in turn is reflected in the attitude of government officials, with resulting investigations, questionnaires, conferences of attorneys general, and complaints by the federal trade commission. Merchants in every line of business are annoyed more or less by bootleg competition. The clothing merchant must contend with fire sales, bankruptcy sales, and other schemes or calamities, but I have noticed that those who are successful in the long run pay little attention to temporary disturbances of that kind. They pursue the even tenor of their way looking straight ahead. I wonder why we cannot come nearer doing that in our business.

The giving of rebates and the making of special allowances should be condemned. There are laws on the statute books in many of the states designed to prevent such practices. One marketer justifies himself by the fact that others are doing it, and the others justify themselves by the fact that he is doing it. It is like the ambitious young lawyer just out of college who secured a partnership with the leading lawyer in his town by telling him that he was about to marry the daughter of that lawyer's most influential client and in turn induced the latter, his fiancee's parent, to consent to the marriage on the ground that he was about to become a partner of the prominent lawyer.

The giving of rebates is a miserable subterfuge. If the trade of some customers because of volume is more important than that of others it may afford ground for a price difference, just as there is a difference between wholesale and retail prices; but preference and favoritism shown among customers of the same class is wholly unjustifiable. And it is short-sighted. When one customer enjoys a rebate or special allowance, that fact travels over the grapevine telephone at a pace which would surprise the Radio Corporation of America. Every customer who is not so favored feels that he is mistreated and is ready to switch his business at the first opportunity. I believe in practical things and not too much in theories, but I think it is both practical and sensible to avoid discrimina-

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tion between customers who are in the same class. If we would do this we would get along better with the trade and with each other, and our relations with the state would be more satisfactory. We should respect uniform price and anti-discrimination laws in their spirit and intent. Permit me to say here that I am making no charge against the head of any company or against any sales manager. I think most of them have too much vision and sense of fairness to approve foolish or narrow practices. The trouble is that the men in the field do not see the situation in a broad light. Perhaps they are not talked to enough. If they knew the views of their executives, if along with the order to move gallonage they received the gospel of fair play, conditions might improve. Please understand that this is not holier-than-thou talk. I assume my full share of blame, whatever it is. No organization is perfect; no executive is so good or so wise that he is always in the clear. What I mean is that we, all of us, should work for a higher standard in marketing methods.

Self-Competition

Day by day the increase in marketing facilities goes on. The same company will provide facilities for the handling of its product, either directly or through others, to the extent of several service stations in the same zone, so that its own facilities force intra-company competition. Economically deplorable as this is, I know of no way to stop it, and presume it must run its course. It is one of the ills characteristic of competitive business. We all know that competitive business invariably loses in economy and that the only way to avoid this is to make the business non-competitive, which means monopoly and a worse evil. I think the time is coming, however, when the pump and tank pace will slacken. When production of product falls below consumption the surplus of marketing facilities will be reduced. At first the least efficient will be abandoned, then the next, and so on. Or, to put it another way, if a company has only a limited quantity of product to market, and that quantity is no more that the requirement of its facilities, it will naturally refrain from further installations. If we ever reach the point, as I firmly believe we shall, when the problem is not how much we can market but how much we can obtain for the market, many of the now too numerous service stations will "fold their tents like the Arab." To my mind this is so plain and certain that it will admit of no denial. Suppose a given company which now has facilities for marketing 1,000,000 barrels annually finds itself able to obtain only 800,000 barrels a year: Will it try to maintain all of its present facilities? Instead of doing this it will dismantle those which are least profitable, those which are least justified economically, and maintain the others. The only time we have had a test of this was during the war when we had the gasless Sundays. We then saw stations that could not get product, and we saw stations closed.

Taxes Common

I have spoken of the future time when distress gasoline will be a thing of the past, when there is not enough to supply the needs of the country. This may be a long way off, but if and when it does come prices will naturally go higher. The public and the umpire can then hark back to the day when the motorist could fill his car at ten or fifteen cents a gallon. It is not to be assumed, however, that new conditions will not be accepted as they may exist. Higher priced gasoline would mean more money being spent for crude, which in turn would mean stimulated activity in exploration and a greater revenue for landowners. We are on firm footing when natural and economic laws are in play, as they always are, and those who do not understand resulting situations have only to learn.

Nearly all of the states now impose a tax of some amount on each gallon of gasoline sold. The tendency is pronounced and continuous. The states that are lower than others are inclined to increase their rates. Each seems afraid that it may not obtain its proportion of revenue compared with other states. What will be the situation when production declines and is less than potential consumption? I have said that prices will advance. They will advance and these taxes will apply nevertheless and be passed on to customers. They will be just that much added to a price already considered high for a product that must be had. They are not so objectionable when the price is low, and in most states they serve an important purpose. But when prices go high, high without the taxes, it may be found necessary to revise the rates downward. What the traffic can stand now it may not stand then. It is always difficult to reduce taxes, and we may see the time when these taxes will oppress consumers on the one hand and cut into our sales on the other. That will be bad for the industry, bad for the public, and bad for the state.

What of Cracking?

There is an excess of refining capacity, and yet no more than would be expected under conditions that have prevailed. Fortunately the worst that can happen is that those who have built unwisely will lose. Surplus capacity may be idle at the expense of the owner or it may be employed at the expense of the industry. Except in periods of excessive crude production it will not be the latter.

There has been agitation about cracking patents. Politicians have howled to the tune of a gasoline trust. All of that is pure bunk, and it will be known as such in the course of time. The Federal Government, a party to our triangle, has brought suit against some of us to enjoin certain clauses in contracts. I do not propose to discuss the merits of that case here. It will be tried in the courts and all parties will have to abide by the decision. But I should like to say that a superabundance of loose talk has been indulged in covering the patents. What is a patent? Are we against patents? Do we want to amend the constitution and take away from Congress the power to reward inventors? Would we repeal our system under which in science we lead the world? Should we write upon the portals of our scientific institutions "Let him who enters here leave hope behind?" I should think it would be better for the coming generations, for those who will succeed us and those who will succeed them in turn, to be told as we have been told that if they betake themselves to study and research, that if they will burn the midnight lamp, they may expect pecuniary reward. Say what you please, but that is what makes the world go round. You may say that the valuable patents find their way into the hands of the big corporations, but do not forget that either as an employee or as seller of the patent the original inventor receives compensation. Whether the compensation is adequate or not is something not involved here; it is the business of the inventor and those with whom he deals. The system itself is as good as any that could be devised, and if there is any fault in its operation it is only such fault as attends all human affairs. Do not forget the millions that have been spent in installation, experiments and rebuilding to bring this particular invention up to its present state.

Any refiner who desires to employ the cracking process is in position to do so upon payment of a fair royalty. I have heard of no complaint against the rate. If it were not reasonable in amount the government would doubtless deal with the aspect of extortion. The fact that certain overlapping or near overlapping patents in a sense have been pooled inures to the benefit of licensees; it gives them clearer right and saves them from charges of infringement. The patents in question were issued by the Government, through a branch or bureau skilled in patent matters, the only one so skilled. And while in this case there is an allegation that the principle of cracking is old, it is noticeable that no effort is made to cancel the patents.

The principle or fact of electricity, for example, is old. Yet even now we are not at the end of its development; and when one contemplates the hundreds of patents held by each of numerous large companies in the electric industries, the paths that the courts have marked out for each to travel without encroaching upon the rights of the others, one realizes that there was not complete anticipation by Franklin when he pulled the lightning from the skies. There are numerous ways of

Conclusions Without Facts

When men, whose positions rank them as "authorities" go wrong on a subject, it is no wonder that the rank and file of just average men get unfair conceptions.

In particular this applies to an article recently written by William Ullman, anent the coming jump in gasoline prices. Part of his article was printed in the Literary Digest, which classes the writer as "one of the best known motoring writers of the country."

Mr. Ullman says it is the opinion of many that the recent reductions were just evidences of a "boost." His reasoning thereafter carries no more logic than the assumption that a price must be lowered in order to be raised, just as a man must lower his body, before he jumps.

This writer goes on to say that motorists are fearful; that "the Wall Street which knows the inside story is reported to be laughing up its sleeve at the explanation given to the public regarding the recent nation-wide slash in gas prices."

The whole editorial effort is without a fact, definitely stated. Take this paragraph:

"With the independents squeezed out of the oil business, from production to filling station, the field will be wide open for the monopoly to do exactly as it pleases with prices, it is pointed out."

Those knowing the oil industry have not seen the independents suddenly erased from the oil industry, in either production or at the filling station.

"Why were gas prices slashed the beginning of October instead of August, for instance? * * * If there had been any genuine desire to unload, would not prices have been adjusted at a season when the motorist would have been in a position to use an excess of gas?"

It seems but fair to ask—would not a clothing merchant keep the price of shirts at a high level, if he knew men would buy them at that price? In August, motorists would have gasoline. The season favored traveling and price was secondary. In October, the desire to travel may have been overcome by cooler weather. So it seems quite logical to reduce gasoline prices when the reduction will gain increased sales.

Mr. Ullman is listed as living in Washington. He could have visited the offices of the Bureau of Mines and found figures to show 1,311,020,845 gallons of gasoline in storage at the end of August. That figure had been reduced to just 1,229,605,883 gallons a month later, rather a heavy inventory to carry into the winter months.

With the lower prices, these stocks were reduced to 1,152,374,237 gallons at the end of October.

It is the presence of men, who need no facts when they write, which makes it desirable for the petroleum industry to give the public facts. At the recent meeting of the American Petroleum Institute at Fort Worth, the decision was reached to do this, $100,000 being set apart to start the work.

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cracking oil by the application of heat and pressure. Some are commerical while others would break the refiner more quickly than grand opera would break the commercial club of Rubensville.

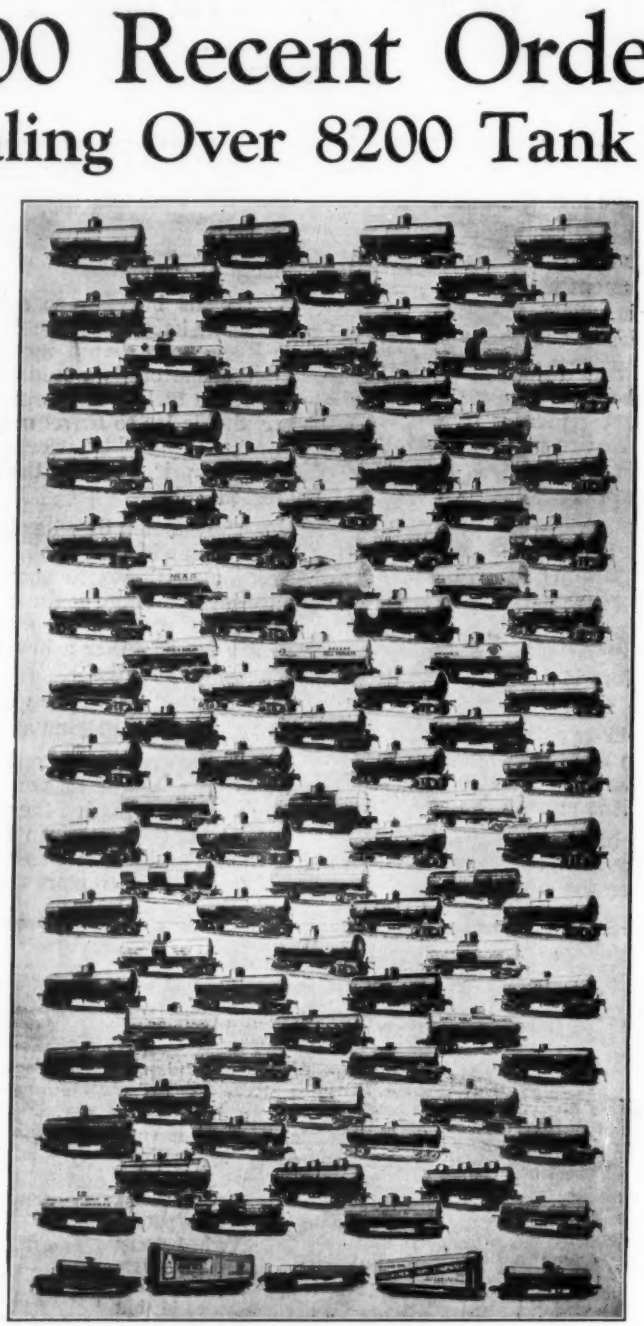
The law wisely denies reward to the dreaming inventor who can not make his dreams come true and bestows it upon the practical man of science who can and does deliver something real, something that will work. What do we of this generation care whether someone sixty years ago patened a cracking process, if his invention was only partial and failed to embrace the vital elements essential to commercial use? It is of no interest to the twentieth century and of less moment to the courts. The law on this point is so well settled that its statement is not an invasion of the realm of legal discussion. We certainly know that the real invention was not made sixty years ago, or else it fell into "innocuous desuetude" and there remained some fifty years. Such inventions once completed do not slumber. Those who have been in the refining business for the last twenty years know that the art of cracking oil had its genesis in this period. Anything back of that was theory void of commercial practice, a thing at which the law smiles in pity. The patent office knows the situation, and it would be an interesting picture if we could see what the patent office thinks. It has repeatedly decided the very issue of patentability, and in considering the numerous applications coming before it in recent years has carefully drawn the lines between what is old and what is new. The patent bar of the country has watched every step with critical eye, and many questions have been litigated to a finish. True, patents are not always valid; but it is equally true that they are valid prima facie.

Patents Are Monopolies

It should be borne in mind that every patent is a monopoly. The word is a terrible one, but the statement is true. Patents constitute one kind of monopoly that is lawful. Perhaps it would be better to call it protection. But whatever the name the same rule applies whether the patent is held by a large company or a small one, by a millionaire or a pauper. Our forefathers had the wisdom to include in the constitution of the United States a section empowering congress to provide for the issuance of patents on inventions and improvements. The primary purpose of the patent grant is to promote inventions for the perpetual good of all the people, giving the inventor a temporary reward, which he can realize by holding the patent or by selling it.

That which the government grants is a seventeen year monopoly in terms. It carries the right to exclude others from using the invention during the life of the patent. The right to exclude implies the right to license with restrictions or upon any terms which the owner of the patent may elect to impose. The public comes into full and free enjoyment of the invention at the expiration of the patent period of seventeen years. So, after all, patents are not such a menace, especially when it is remembered that they have served to stimulate invention, and that invention is the outstanding feature of our age and civilization.

100 Recent Orders
Totaling Over 8200 Tank Cars



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American Car and Foundry Company

New York	Chicago	St. Louis
165 Broadway	Railway Exchange Building	915 Olive Street

Tell them where you saw the ad

The Maintenance of Refinery Equipment

(Continued from page 17.

thing, only to drop it for another. This is a waste of time. Pass quick judgment, picking out the solution that at the moment seems best, and then follow it through to a logical conclusion despite all dissuasion. Other methods may appear that look better, but if you jump from one to the other time will pass and you will likely be no nearer a final solution. Pursue one idea without being sidetracked, until you are sure you have exhausted its possibilities.

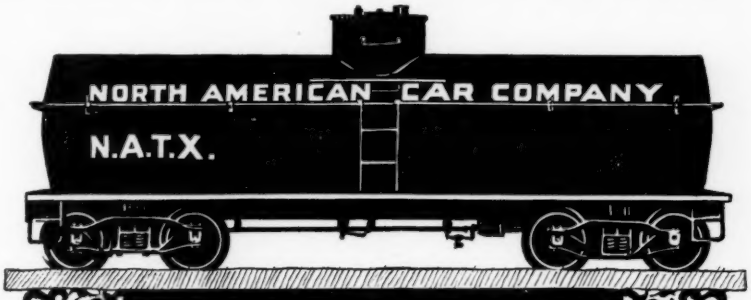
Speed of transportation of materials is a big item in repair work. Trucks should be used by all means, rather than teams, for they will far more than pay for themselves by preventing delays to the workmen. All trucks, and teams too, should be dispatched from one place, preferably the storehouse. Any person desiring hauling done will then send his request to the storehouse well in advance. The trucks and teams will haul the material, and, upon delivering it, will report in by phone for the next assignment. The storehouse will route the teams so as to save the empty back trips and accomplish several errands at the same time, where possible. The storekeeper can then become responsible for the delivery of his materials to the job. How familiar is the sight of two or more workmen jurneying a half-mile or so to the storehouse to bring back, say, a couple of flanges, their comrades on the job meanwhile busily waiting for them! The foreman should have anticipated his requirements and ordered the flanges by phone in time, so that the truck could deliver them before they were actually needed. The same holds true of work gotten out by the pipe shop or the machine shop for use in the field. sometimes it seems to take four to six men to preside over a pipe machine or lathe and watch it so that one man can work it. Such men should not be allowed in the shops at all. If occasion arises, as sometimes will, that measurements for the last cut cannot be taken until all the rest of the pipe work is run up tight, the job will have to stop and wait for the cut, but the men will not. Let them clean up the job,—this never gets fully done, anyway,—or send them to the junk yard and let them help break up fittings until their cut is ready. The man who runs the pipe machine will appreciate this and do better work without an audience, and the workmen will not get into the habit of loafing.

In contrast with this, pieces of equipment often are ordered made in the shops and then are allowed to lie around under foot or cluttering up the aisles for days because someone has forgotten to call for them. The shop should deliver each piece immediately as it is done, and thus keep their space cleaned up. Shops are working places, not storehouses. Convenient push-carts should be provided a-plenty for the workmen to carry loads not large enough to require a team. On some of these should be mounted large tool boxes with vises for the pipe fitters, and smaller boxes for the machinists. Others should have an underslung tongue for hauling pipe and heavy castings.

The Junk Pipe

Every refinery has a junk pile. In how many of them is this junk worked over and every possible good item separated, and the scrap sorted so as to bring the biggest price from its sale? There can usually be found around the yard some old timer not so active as he once was, but who knows fittings and materials from A to Z. Give him a bench, a vise and a few tools, a roof over his head and some bins into which to sort his materials, and you will be surprised at the amount of useable stuff he will turn back into the storehouse.

Shops are in the habit of accumulating a lot of odds and ends of scrap iron, brass, etc. The argument is that they so often come in handy and save a trip to the storehouse. This argument is overworked, and it is a mighty healthful thing to go through the bins and shelves once in a while and clean them all out, lock stock and barrel, send the good stuff back to the storehouse which is equipped to keep it, and give the rest to Old Man Salvage to work upon.



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Cleanup work should be a matter of regular routine. In the shops it should be insisted that all machines shall be left clean at the end of the day's work, and a regular hour should be devoted exclusively to cleanup at the end of each week's work. Men can do so much better work in clean places than when climbing around over miscellaneous junk on the floor and in the bins. "A place for everything, and everything in its place" should be carried out almost as scrupulously in shop as on board ship.

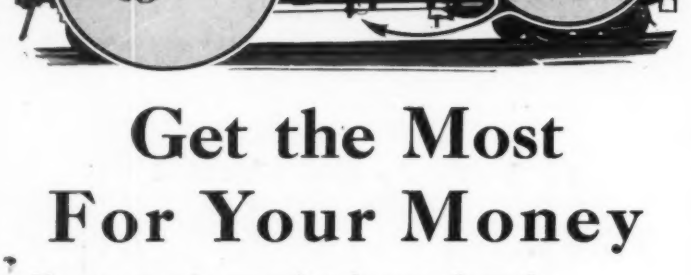
Cleanup work after a job out on the plant seems to be a difficult achievement. How often you can walk about and see ditches left open where a pipe has been repaired, or bits of scaffolding and leftover materials strewn around. The jobs are not finished! Even though the equipment is running again, the operating foreman, the master mechanic and the last repair foremen on the job should each make it a point to see that the work is cleaned up in at least as good condition as before the work started. Regular places should be designated where trash to be hauled away can be piled, and a cleanup team or truck should make regular trips over the yard once a day, and gather in all this refuse and deliver it to the junk yard to be overhauled.

Tools In One Place

Tools of all kinds should be the property of a central tool room where they can be properly stored and kept in repair. This is jut as important as to keep stores in a central storehouse, and for the same reason,—prevention of duplication. They should be charged out to the workmen who should exchange them for fresh ones as fast as they become dull or damaged. They can thus all be kept in an efficient and uniform condition. In one refinery this has been extended even to the caulking tools of the boiler makers. These are all ground at the tool room according to carefully prepared standards, and are issued in liberal quantities to the workman. As soon as one tool is dulled he lays it aside and takes up another, and later trades in the lot for sharp ones. How much better this is than to have each caulker waste time journeying across the lot to and from the emery wheels and leisurely grinding tools according to his own whim. It is true that the caulkers objected strenuously at first, but later, when they found they could get sharp tools always alike, accepted without protest.

There must be some control over the amount of work done by the repair departments, and the order in which it is performed. If each operating foreman is allowed to go to the repair foreman with almost any request, a lot of work will get done that may not be necessary, will not pay dividends or, possibly, some work that is not repairs but capital expenditure for improvements. Moreover, each repair foreman will be hard pressed to know which jobs to tackle first as being most important. And the operator who yells the loudest or stands in best will usually get his work done first, which may not be to the best interest of the whole plant.

All requests for work should be addressed to the master mechanic. And, as he is a busy man, he may have to have an order clerk to handle this work. Possibly the same man can handle the teams and trucks at the storehouse. At any rate, these requests must all be carefully scrutinized by someone thoroughly familar with the policy of the management, and only those which represent needed repairs allowed. All those which savor of improvements to property or of unnecessary elaboration should be referred to the master mechanic for decision. The repair requests should then be worked up into definite, written orders before they are passed out to the repair foreman. These repair men have neither time nor incentive to work the game of the proverbial plumber who journeys to the job and then back to the shop to see what tools he will need. The order must tell them clearly and simply just what work is to be done, so that they will know what tools and repair materials to take on the first trip, to what account the work is to be charged, and above all, when the job has to be finished, so that they can fit this in with their other orders and know which has priority. A copy of the order should go to the operating foreman, so there



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can be no misunderstanding of what work is to be done.

Here the experienced reader will raise a protest. Refinery repair work is a rapid-fire proposition and will not stay scheduled. This the writer believes to be partially true. A part of the work must be done "Rush", but there is much of it that can be lined up a day or more ahead of time. And the more prevention work is carried out the less rush work there will be. The order clerk and the master mechanic should keep in mind the amount and importance of work ahead of each crew and line up new work accordingly. The master mechanic will be continually going over the orders with his foremen and rearranging them and should eventually develop a flexible scheduling scheme.

Cost Keeping

How much costs should be kept on repair work? Only so much as can actually be used to help in cutting costs. Too often an interesting-looking lot of data is collected and then never used, mainly because it is not presented in a simple, intelligible manner to those who can use it to cut costs, backed by the enforcement of the management.

As already stated, the objects of the maintenance department are:

1. To prevent breakdowns.
2. To perform necessary repairs quickly and cheaply.

Costs, then, should measure the success of these two kinds of efforts, and should present them in a manner intelligible to the men responsible for their occurrence, mainly the operating foremen, and the superintendent. The refinery should, therefore first of all be departmentalized, and the work chargeable to each department or foreman reported separately.

One measure of success with which preventive work is being done is the amount of time operation is held up in each department or on each piece of equipment while it is being repaired. This is usually far more important than the costs of the repairs. This should not include the advantage the repair crews may take of the equipment's being idle for lack of work for it to do. Each operating foreman, then, should prepare such a statement of lost time due to repairs each month. The management may also be interested in the time lost due to lack of work, but this is a separate matter. The time lost due to repairs in a well kept up department should be small and rather constant. It this lost time shows a sudden rise both the operating foreman and the master mechanic should be called upon for an explanation. Possibly repairs have been neglected for a few months due to an unusual press of business; possibly the storehouse failed to secure some important repair part on time; or possibly the operators failed to oil or pack properly.

Repair costs should be distributed at least monthly to the operating departments, and statements of these costs issued to the operating foreman and the master mechanic. And these costs must be used. Unless the foreman and repair men know these costs are being watched, and that they will be called upon promptly to explain any unusual expenditures, the time of collecting the figures could better be spent on more productive work. However, if the lost time and the cost of emergency repairs are presented to the foremen who are responsible, and if the superintendent can take time from his million-and-one other duties to go over these costs with the foremen, they will soon settle down to a more or less uniform, low figure.

An operating foreman may at times be hard pressed to explain a change in his repair costs, especially if his department is a large one. Perhaps the cost of firebrick went up. Or perhaps a lot of extra work he did not know about had to be done on some valves sent to the machine shops. He is then justified in calling for more detailed statements from the cost department so that he can tell his superintendent just which jobs it was that ran the costs up and which of the repair foremen were responsible for them. Some system of keeping separate costs on each job can then be installed, and this will have the real advantage of making the costs intelligible to the repair foremen, as the cost of pipe work can be separated from the cost of brick work, and so forth.

Let me emphasize here once more that detailed costs should not be installed unless it is sure they will be used. The first and necessary step is to get the monthly costs home to the

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foremen. The second step is to analyze these costs into their details. And this step should be taken only when there is a real demand for it from the foremen themselves. The writer has seen such a system of job costs fail after a trial of several years, for about three reasons: First, the operating superintendents were so busy that they could not consistently take up the monthly costs with their foremen, let alone the detailed job costs. So there was no executive pressure behind the system.

Must Be Prompt

Second, the cost department was so delayed in its work that the job costs were 30 to 60 days old before they got out to the foremen. Consequently, they were stale and useless. Everyone had forgotten the details of the job by that time. Any kind of costs are of little or no value unless they are fresh off the bat and contain live information.

Third, the costs, when finally returned, were often grossly incorrect. This was because there were not sufficient checks on labor and material distribution. In other words, not enough discipline behind the system.

Despite this failure, however, the writer is still of the opinion that a job cost system can be made to pay handsome dividends.

Have we not given the repair foreman quite a bit of office work to do? He will have to keep track of all these orders, keep time on his men, and write out material requisitions on the storehouse. Then why not let him have a clerk to do this routine work for him? A clerk will cost just about one third as much as he will, and he needs every moment he can get with his men in the field, especially as they are probably scattered all over the lot. If he has not enough work to keep a clerk busy, put him in the same office with one or more of the other foremen and let one clerk take care of all their work. At any rate, all the foremen's offices should be grouped together close to the storehouse, shops and salvage department. Give them what clerks are necessary and then chase them out of the offices and see that they stay out.

Use the Telephone

We have now relieved the foreman of his office work by giving him a clerk, and have given him an inspector to take care of his prevention work. Can there be any doubt that he is going to keep his men better lined up on their jobs and keep materials and work better lined up ahead of them? But still his men are scattered out so much that he cannot be with all of them all the time, and some of them will run out of work before he can get to them. They should then be dispatched similarly to the teams and trucks. Instead of journeying all the way in to the foreman's office they should go to the nearest telephone and report to the clerk. In the meantime the foreman will have been through the office, picked out the

RECENT REFINERY PATENTS ISSUED

BY STAFF REPRESENTATIVE

Washington, D. C.—The following patents of interest to the refining industry were granted by the United States Patent Office during the month of November:

No. 1,513,745, granted November 4 to David T. Day, Washington, D. C., for a process of extracting paraffin-like wax materials from hydrocarbon oil-bearing shale which comprises immersing the shale in a bath of boiling solvent material characterized by its ability to substantially completely separte from the paraffin-like material when the latter cools, and is thereafter immediately reusable on fresh shale, extracting the waxy material by the solvent action alone, separating the solvent and extracted material from the shale, and separating the solvent from the extracted material by cooling the mixture to a point below the solodifying temperature of the wax.

No. 1,514,040, granted November 4 to Victor Lee Emerson, Philadelphia, for an apparatus for the conversion of hydrocarbon oil consisting of a still, a valve controlled conduit for supplying oil to said still, said still having a base receptacle for the reception of said oil, a preheater connected with said supply conduit, a conduit connecting said preheater with said receptacle, a pump connected with said receptacle and with said supply conduit adapted to circulate the oil from said receptacle through said preheater and conduits back to said receptacle.

No. 1,514,098, granted November 4 to Charles S. Palmer, Pittsburgh, assignor to Standard Oil Company of Indiana, for a process of treating relatively high boiling point petroleum oils for the production therefrom of relatively low boiling point oils, which consists in passing the high boiling point oils through a heating zone while under a substantial liquid pressure sufficient to prevent the evolution of vapors at the temperature required for decomposition of the oil, passing the decompoed oil through a cooling zone in which the pressure is gradually reduced in proportion to the reduction in temperature and pressure as to permit the evolution of the vapors of the lower boiling point products.

No. 1,514,162, granted November 4, to Alexander Francis Kelsey, Edmonton, Alberta, Can., for an apparatus for recovering bitumen and crude oil from tar sand, oil sand, bituminous sandstone, shales and the like, comprising a separating container having an overflow conduit, a waste conduit connected to the bottom of the sand container, means for feeding material into the side of the container, a screen in the lower

jobs next ahead, and lined up with the clerk where to send men next. But perhaps some problem will have arisen which requires the personal attention of the foreman. Some kind of a code whistle scheme should be installed in every refinery of any size and should be used freely, despite the annoyance of others having to listen to the whistle all day long. All the way along the writer has been trying to emphasize the importance of saving the time of the workman, first, by delivering his materials to him on the job before he needs them; second, by giving him a definite lineup on the job, including tools he will need, before he goes to it; third, by directing him to the next job without his having to come clear back to headquarters each time; and lastly, by giving him a means to get in touch with his foreman when he needs him, without hunting all over the lot.

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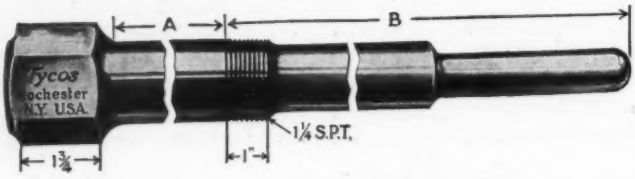

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part of the container, means for heating the material in the container, means for maintaining a flow of water through the container, and means for feeding material from the waste conduit, the said means comprising a pivoted shutter, a compartment and valved conduits leading from the shutter to the said compartment.

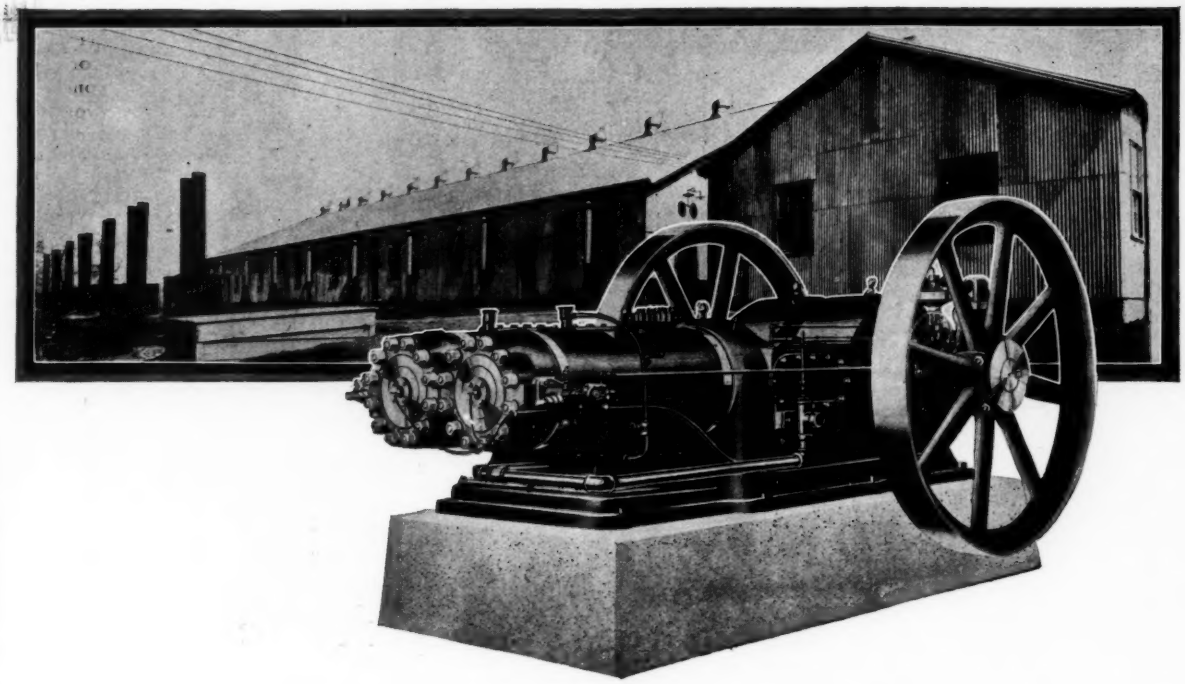
No. 1,515,597, granted November 18 to Peter P. Hindelang, San Antonio, assignor by mesne assignment to Standard Fullers Earth Co., Inc., San Antonio, for a method of separating oil from fuller's earth inpregnated with oil which consists in forcing air, steam, water, and steam therethrough successively in the order enumerated.

No. 1,515,733, granted November 18 to Roy Cross, Kansas City, Mo., for a refining material for treating petroleum hydrocarbons consisting in a highly absorbent inorganic material combined with a metal salt, the latter having an affinity for the sulphur compounds of the hydrocarbons.

No. 1,516,166, granted November 18 to Leo Wallerstein, New York, assignor to Gasoline Recovery Corporation of Delaware, for a process for recovering gasoline from natural gas which consists in contacting the natural gas with a shower of absorbent carbon in a solid state, whereby the gasoline is absorbed by the carbon, then subjecting the carbon and the absorbed gasoline to a distilling treatment to vaporize the gasoline, and finally condensing the gasoline.

No. 1,516,285, granted November 18 to Claude Leslie Freeland, Bristow, Okla., for an apparatus for refining crude oil comprising a heater for the crude oil, tubular concentric casings spaced apart from each other, means for heating the space between the casings, connecting means between the inner casing and heater for delivering the heated oil to the inner casing, means associated with said connecting means for imparting a whirling motion to the heated oil about the axis of said casing so as to separate the low gravity products from the high gravity products while moving longitudinally thereof, and means at the delivery end of the inner casing for collecting the vapor at the center of the whirling oil, said means being adjustable into and out of the casing.

No. 1,516,358, granted November 18 to Luther B. Thomas, Shreveport, La., for an oil storage system including a storage tank having a closed top and bottom, a pipe for supplying oil to the tank, a pipe leading from a source of water supply and adapted to supply water to the tank, at the base thereof, to maintain the oil in engagement with the top of the tank, a separator and a condenser in connection with the tank, and adapted to condense vapors and return the condensates to the storage tank.



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			Thousands of dollars	Av. per gal. (conts.)	
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Texas	100	177,765	14,752	8.3	113 733
California	119	173,329	16,564	9.6	211,409
West Virginia	162	63,381	8,890	14.0	164,906
Louisiana	35	40,720	3,484	8.6	87,944
Wyoming	10	21,292	1,992	9.4	24,523
Pennsylvania	196	19,132	2,560	13.4	55,238
Arkansas	7	16,183	1,916	11.8	3,975
Ohio	44	10,035	1,446	14.4	39,805
Kentucky	11	7,601	1,067	14.0	22,925
Kansas	13	8,775	690	7.9	10,843
Illinois	86	7,356	851	11.6	3,207
New York	5	408	44	10.8	640
1923	1,067	816,226	77,263	9.5	875,711
1922	916	505,832	72,711	14.4	545,139
1918	1,004	282,536	50,364	17.8	449,109
1913	341	24,061	2,458	10.2	9,889

Big Increase for 1923 Natural Gasoline Output

Natural gasoline output in 1923 showed an increase of 61 per cent over 1922. The 1923 total of 816,226,000 gallons was double that of 1920. These figures are from the report recently issued by the United States Geological Survey.

The report has these paragraphs concerning the increase of output and plant capacity:

"The rank of the four leading states: Oklahoma, Texas, California and West Virginia— in 1923 remained the same as in the last few years, although Oklahoma's output increased 46 per cent and that of West Virginia only 16 per cent, whereas the output of Texas increased 130 per cent and that California 198 per cent. The increased production of natural-gas gasoline in California followed the development of the new fields, in the Los Angeles Basin, in which great quantities of natural gas were produced with the petroleum but only a fraction of the gas available was utilized and large quantities both before and after extraction of gasoline were not consumed.

"During 1923 the number of compression plants decreased and the number using the oil-absorption process, both singly and in combination with the compression process, increased; the new charcoal process, by which natural gas is brought into intimate contact with activated charcoal, in the capillaries of which the vapors are condensed, was reported in use by ten plants. The increased average capacity of the plants now in operation, contrasted with those of five years ago, is emphasized by the fact that although the total number of plants operated in 1918 and 1923 were about the same, 1,067 in 1823 and 1,004 in 1918, the output in 1923 was almost three times that in 1918."

Phillips Acquires Plant Of E. A. Landreth Company

Breckenridge, Texas.—A deal involving one of the largest natural gasoline manufacturing plants in the world was consummated late in November when the Phillips Petroleum Company of Bartlesville, Oklahoma, purchased the plant and producing properties operated by the E. A. Landreth Interests in the Ibex field, Shackelford County, Texas, for $2,500,000 and other considerations. The gasoline plant has a daily gasoline production ranging from 45,000 to 47,000 gallons, and is handling about 50,000,000 cubic feet of gas daily through high pressure absorption units, while an additional 18,000,000 cubic feet of gas is handled through low pressure absorption units. A charcoal process unit is operated in connection with this plant and is netting a yield of about 9,000 gallons of gasoline daily from the residue gas of the high pressure absorption units. A record of 20,200 gallons production during an eight-hour run is credited to this plant.

This plant is the only one in the Ibex field, and all gas contracts were acquired by the Phillips Petroleum Company in the transaction, besides producing properties consisting of 2,120 acres of proven and semi-proven leases with 19 wells making 375 barrels of high gravity oil daily from the 3400-foot lime. A fleet of insulated tank cars and interest held by the Landreth Gasoline Company and 32 miles of 16 and 2½-inch gas line were also included in the Phillips Company's purchase.

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Mid-Continent Refinery Runs of Dec. 1 Show Gain Over Throughput of Nov. 1

Tulsa, Okla.—With the Gulf Refining Company plant at Fort Worth, Texas, shut down for repairs, the increase of refinery runs for the first day of December was still 8,000 barrels above the mark set on the first day of the previous month. The Gulf plant was running approximately 6,000 barrels before shutting down.

Every refining section of the Mid-Continent area showed an increase in daily runs over the runs of November 1, and the total reached 364,000 barrels daily for December 1.

The increase of approximately five thousand barrels in Oklahoma is accounted for in the increase of the Cosden Refining Company at West Tulsa, running a little better than 32,000 barrels per day. Cosden is showing an increase of a total of 8,000 barrels which, besides being responsible for the increase for the state, has also applied a part of their runs to offset the decline in some of the smaller plants. Four thousand barrels increase is shown on the runs of the Sinclair plants in their four Mid-Continent refineries. It is reported that Cosden Refining Company is drawing upon their stocks in order to increase the refinery runs.

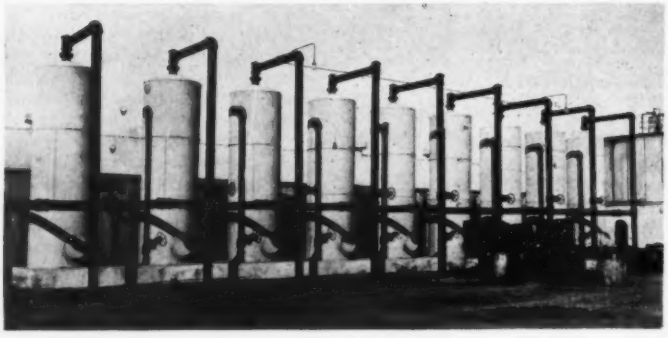
Following is a compilation showing the daily average runs on December 1 for the Mid-Continent area:

State—	Nov. 1 Barrels	Dec. 1 Barrels
Oklahoma	166,290	173,000
Kansas	67,400	69,000
North Texas	84,500	82,000
North Louisiana	24,000	25,000
Arkansas	12,650	13,000

The Standard Oil Company (Kansas) plant at Neodesha increased its runs 5,850 barrels by boosting the total for December 1 to 11,000 barrels. This is the only important change in Kansas with the exception of the Sinclair increases in their Argentine and Coffeyville plants.

Although the Gulf plant at Fort Worth is shut down, the state still shows an increase of 2,500 barrels. The major part of this addition is shown in the Tidal Refining Company resumption of operations in their Burkburnett refinery, now running 2,000 barrels daily.

The thousand barrels increase in North Louisiana is partly accounted for in the increase of runs by the Louisiana Oil Corporation and the Shreveport Producing & Refining Corporation. The only change noted in Arkansas is a 350-barrel increase by the Lion Oil & Refining Company.



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New Waite Phillips Plant To Be Operating Shortly

Wichita, Kansas.—The work of reconditioning the Sterling Oil & Refining Company plant here which has been acquired by the Waite Phillips Company of Tulsa, is progressing rapidly so that actual operation of the refinery is expected by January 1, 1925. Upwards of $50,000 is being spent to put the refinery in shape.

V. R. Oakley, who has been superintendent of the Waite Phillips Company's refinery at Okmulgee, Oklahoma, has been transferred to Wichita where he will be superintendent of the refinery here.

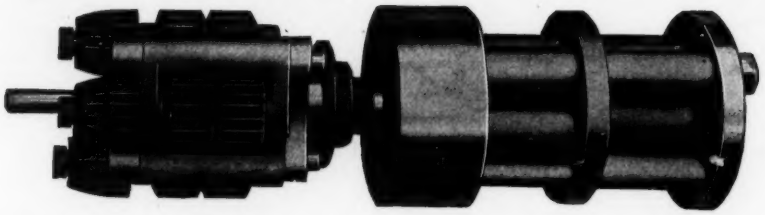
The Wichita refinery has a rated capacity of 5,000 barrels daily and has already installed a cracking process. Crude for the plant will be run from the Waite Phillips Company's production in the Rainbow Bend field in Cowley County, Kansas. Construction of a pipe line to connect the field with the refinery already is under way and will shortly be completed. Three pumping plants are to be built along the line.

O. L. Cordell of Tulsa is vice-president of the Waite Phillips Company in charge of refineries and has supervision over the Wichita plant reconditioning work.

New Plant Ready

Henryetta, Okla. — The absorption plant of the United States Zinc Company near here is nearing completion and when placed in operation will have a rated capacity of 1500 gallons daily.

Roto Tube Cleaners



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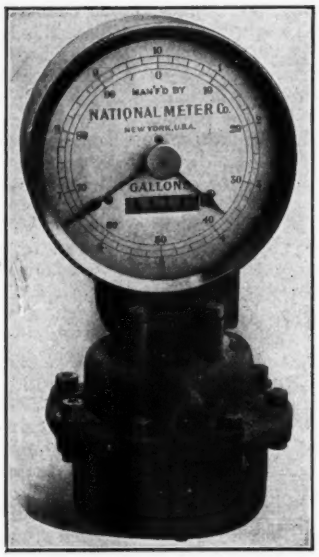

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Lone Star Tank Car Co. Opens Fort Worth Shop

Fort Worth, Texas.—The Lone Star Tank Car Company, which has been operating a contract shop at Wichita Falls for the repairing of railroad tank cars for the past five years, has opened a new shop at Fort Worth.

This company is composed of W. A. Stuckey, C. A. Stuckey and Mrs. Grace Higgins, who have given the business their personal attention and have built up a credible business at Wichita Falls.

The Fort Worth shop will be managed by Mrs. Higgins, personally, under the supervision of W. A. Stuckey, who will devote part of his time to the Fort Worth shop. While this is rather an unusual vocation for a woman, yet Mrs. Higgins has been actively associated in the business at Wichita Falls for the past five years and has a practical knowledge of the business, and is well versed on ARA rules and billings.

Mr. Roy Ashton, formerly with the MK&T Railway Company at Wichita Falls, has recently taken charge of the mechanical department at Fort Worth.

Charcoal Process Plant To Be Built at Wortham

Mexia, Texas.—The heavy gas production accompanying the high gravity crude being produced in the new Wortham field in East Central Texas offers a new field for the natural gasoline manufacturers, and the Humphreys-Boyd Oil Company has taken the initiative in starting the first plant for the field. This company is ordering materials to erect a charcoal process plant to handle 20 million cubic feet of gas, and a test made of the gas production from the first two wells completed in the field shows a yield of more than one-half gallon per thousand cubic feet. This yield will increase after the wells have been allowed to produce for a few months. The plant will be located on the J. H. Wasson land, located on the west side of the field, and will be the second charcoal process to be installed in Texas, as a plant of this type is now in use in the Ibex field, where it is operating exclusively on residue gas from high pressure absorption units.

Bond Holders Buy Plant Of Constantin Company

Tulsa, Okla.—Properties of the Constantin Refining Company with an estimated valuation of some $8,000,000 placed on it during the war days, was sold at auction here December 8 for $858,000 under orders of the United States district court. The purchasers who offered the only bid recorded compose the bondholders protective committee.

A new corporation is expected to be formed to operate the properties after reconditioning has been done and the properties placed in shape. Pat M. Malloy of Tulsa, who was counsel for the company before receivership was instituted in March, 1923, has been receiver for the company and it is understood he will head the new concern when it is perfected.

The bondholders protective committee comprising the purchasers was represented at the auction by the following: H. C. Rorick of the Spitzer-Rorick Trust and Savings Company of Toledo, Ohio; W. H. Lippincott of Lippincott & Company of Philadelphia; and Paul Prudden of Prudden & Company of Toledo, Ohio.

Building Storage

Beaumont, Texas.—The Atlantic Refining Company is erecting four new 80,000-barrel steel tanks at its Atreco export terminals near Beaumont to furnish adequate facilities for handling large quantities of gasoline and other light oils. Atlantic plans to become an active buyer of various grades of motor fuels and export gasoline from independent refiners in the Mid-Continent district during the early part of 1925, and this new tankage is being erected to store the purchased products between sailing dates of its tankers. Atlantic is shipping considerable crude to the Atlantic Seaboard through the Atreco terminals, and most of the deliveries are made from the East Central Texas oil fields via the Pure Oil Pipe Line Company's line.

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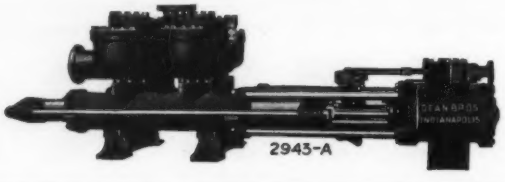

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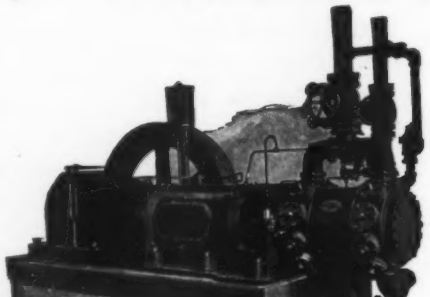

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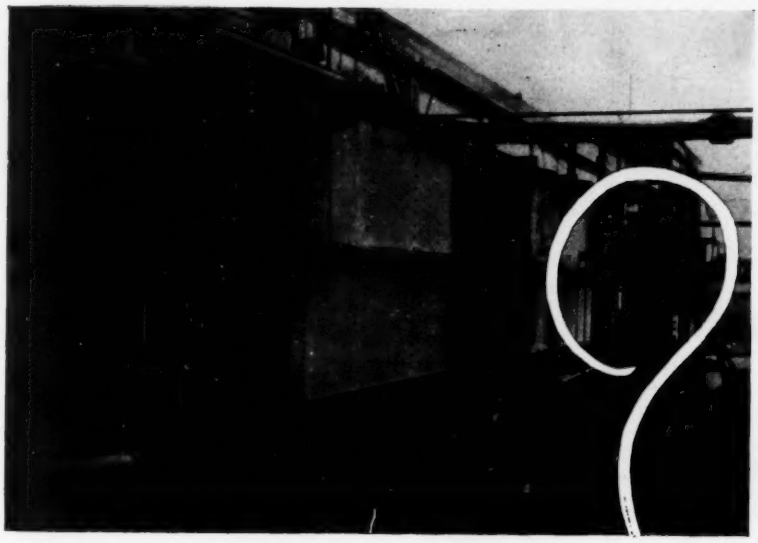

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Kansas City Draws Next Gathering of Refiners

Tulsa, Okla.—At the meeting of the board of directors of the Western Petroleum Refiners Association, held in Fort Worth in connection with the American Petroleum Institute, it was decided to hold the next annual meeting of the refiners association at Kansas City, commencing March 3, 1925.

The program and entertainment committees will be announced later.

Vapor Tests Continued

The Association of Natural Gasoline Manufacturers has assumed the work of making further vapor tension tests in Oklahoma and Kansas in connection with the effort being made to determine whether the Anderson method shall be adopted or the present method be continued with improvements. Roger Lentz of Tulsa, a capable and experienced plant operator, is conducting these tests in the two states and B. L. Pillow of Baton Rouge, Louisiana, assistant to the president of the Standard Oil Company (Louisiana), is in charge of the work in Arkansas, Louisiana and Texas.

Office for Tulsa

New York, N. Y.—The Carbide and Carbon Chemicals Corporation with general offices here announce the opening of Mid-Continent offices at 507-508 Exchange National Bank Building in Tulsa.

The Mid-Continent offices will be in charge of W. F. Reich, Jr. The Carbide and Carbon Chemicals Corporation are originators of the gasoline stabilizing process for natural gasoline plant operation.

Bankers Plant Leased

Wichita Falls, Texas.—The Bankers Petroleum & Refining Company's 1,000 barrel daily capacity skimming plant located near Wichita Falls has been leased to H. W. Roberts and associates of Wichita Falls, and the capacity of the plant is to be increased to 1500 barrels daily. It is planned to make export grades of gasoline in the plant when it is placed in operation around the first of January.

C. E. Sullivan, general sales manager of the Foxboro Company of Foxboro, Massachusetts, has recently completed a tour of the oil country in the interests of company business. While in the Mid-Continent field he was the guest of W. C. Brown of Tulsa, district manager for the company in that section, has since returned to Foxboro.

W. L. Kistler of Tulsa and Denver has resigned as president of Producers & Refiners Corporation, effective December 15, 19[illegible]

Regional Conferences Held

Tulsa, Okla.—During November regional conferences of members of the Western Petroleum Refiners Association were held at various points in the western refining territory between Chicago and Tulsa. The conferences started at Fort Worth and then were held at Chicago, later St. Louis and then Kansas City and Wichita.

According to Howard Bennette, managing director of the Western Petroleum Refiners Association, the idea behind these regional conferences is to enable the organization's members to take part in the proceedings without having to leave their business.

Plant Equipment Bought

Tulsa—The Phillips Petroleum Company of Bartlesville, Oklahoma, have purchased twenty 165 H.P. Clark compressors for their new gasoline plant in the Papoose field near Wetumka, Oklahoma. Construction of the plant now is under way.

The Western Oil & Gas Company of Oklahoma City are building an addition to their gasoline plant at Morrison, Oklahoma. This plant originally contained three 80 H.P. Clark direct driven gas engine compressors and this company's last order was for four more 80 H. P. Clark units.

To Operate Plant

Baltimore, Md.—The Indiahoma Refining Company plant at Okmulgee, Oklahoma, with a rated capacity of 10,000 barrels daily is to resume operation under the direction of a new organization backed by Baltimore interests. Business offices of the new company will be located here while F. C. Winters, formerly connected with the old Indiahoma company, will be in charge of the Okmulgee plant.

New Office Opened

The United Iron Works, Inc., of Kansas City has opened a branch office at 439 East Third Street in Los Angeles, California, in charge of J. L. McGinnes who will be district sales engineer. All lines of the Uni[illegible] Works' business will be handled by the West Coast office.

Tulsa Office Op[illegible]

Taylor Instrument Company has opened a Mid-Continent office in the Mayo building in Tulsa in charge of E. H. Triphaus, who is covering the MidContinent territory f[illegible] this company which has general offices and works at Rochester, New York.

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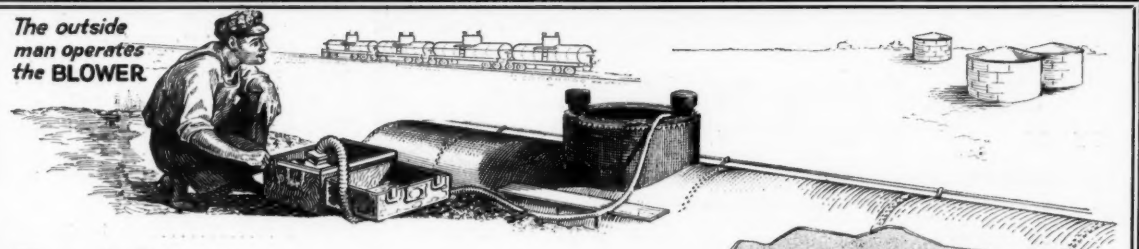

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Sal Soda wks .....cwt.	1.10–1.25
Caustic Soda 76% .....cwt.	3.10
Chloride of Lime solid .....cwt.	1.90–2.10
Sulphuric Acid 60 deg.tank cars f.o.b. shipping point per ton	9.00–10.00
Benzol—	
90% tank cars	.23
Pure tank cars	.24 .25

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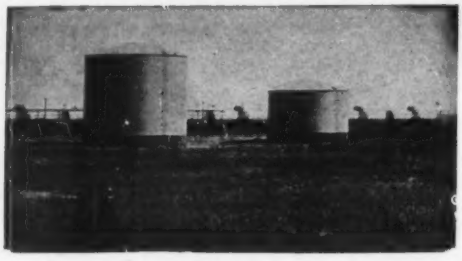
*Linseed, carloads, spot ...gal.	$1.05
November .....gal.	1.05
Less carload, spot .....gal.	1.05
5 bbls. or less spot.....gal.	1.11
Boiled, tank spot .....gal.	1.01
Boiled, carloads, spot.....gal.	1.07
Soya Bean, spot, tank.....lb.	.11¾
Animal Oils—	
English Degras .....lb.	.04⅝
Domestic Degras bbls. carloads .....lb.	.04¼
Horse .....lb.	.09½
Oleic Acids—	
Dist. .....lb.	.11
Saponified .....lb.	.11
Lard Oils—	
Prime Winter	
Strained .....1 to 1½ ffa. 40/45c. t. lb.	.18½
Extra Winter	
Strained .....2 to 4½ ffa. 40/45c. t. lb.	.17¼
Extra....4 to 5 ffa. 40/45c. t. lb.	15¾
Extra No. 1 .....7 to 10 ffa. 40/50c. t. lb.	.13¾
Extra No. 1 .....15 to 18 ffa. 40/50c. t. lb.	.13
No. 2..22 to 23 ffa. 40/45c. t. lb.	.12¼
Prime Edible Tallow under 1⅞ ffa. 40/45c. t. N. Y. .....lb.	—.11¼
Tallow acidless .....lb.	—.12¾
Lard Stearine .....lb.	—.18
Oleo Stearine .....lb.	—.11¾
Neatsfoot Oil—	
Pure .....bbls.-lb.	—.15¾
Extra .....bbls.-lb.	—.13¾
No. 1 .....bbls.-lb.	—.13
Cold Pressed .....lb.	—.18½
Fish Oils—	
Menhaden Oil	
Light pressed .....gal.	.70–.72
White .....gal.	–.75
Yellow bleached .....gal.	–.73
*Herring, tankcars coast....gal.	–.40
Whale, ext. winter bleached gal.	–.80
Seal	Nominal
Naval Stores—	
Turpentine, N. Y. .....gal.	.81
†Turpentine .....gal.	.75½
Rosin B., N. Y. .....bbl.	7.35
Rosin F., N. Y. .....bbl.	7.35
Rosin B.† .....bbl.	6.10
Rosin F.† .....bbl.	6.10
Rosin Oil 1st run.....gal.	.45
Rosin Oil 2d run.....gal.	.47
Pine Tar—	
Kiln Burnt .....bbl.	12.00
Retort .....bbl.	11.50

*Nominal.
†Savannah, Ga., market.



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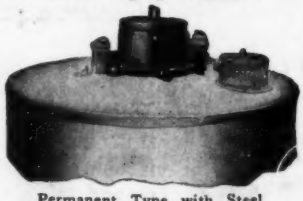

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DUBUQUE, IOWA

OMAHA MINNEAPOLIS DES MOINES

Complete stocks also carried by Butler Mfg. Co., Kansas City, Mo., Preferred Utilities Co., 250 W. 57th St., New York, U. S. Flexible Metallic Tubing Co., San Francisco, Seattle, Los Angeles.

McDONALD

X515